

# **DOUGLAS COUNTY UTILITIES**

## **WATER CONSERVATION PLAN**

**July, 2008**



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This Plan is mandated by NRS 540.131 and is compliant with NRS sections 540.121 through 540.151

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Douglas County Utilities (DCU) provides potable water to customers within an overall service area that includes East Valley, Genoa Lakes, Sunrise Estates, Fairgrounds, China Springs, Jobs Peak, Sheridan Acres, Skyland/Cave Rock, Uppaway and Zephyr Cove. This service area is divided into one district and seven sub-districts which operate as essentially separate systems. These systems are described as follows:

<b>District or Sub-District</b>	<b>District or Sub-District Service Area</b>
West Valley Water District	Walley's Genoa Lakes/Sierra Shadows Mountain Meadows Montaña
Tahoe Sub-Water District	Zephyr Cove Skyland/Cave Rock Uppaway
East Valley Sub-Water District	Airport Mountain View East Valley
Foothill Sub-Water District	Sheridan Acres Jobs Peak
China Springs Sub-Water District	China Springs
North County Sub-Water District	Wells #1 and #2
Sunrise Estates Sub-Water District	Wells #1 and #2
Fairgrounds Sub-Water District	Well #1

According to U.S. Census data, the population of Douglas County grew at an approximate average rate of 2.4 % per year between 2000 and 2005. In addition to population there has been substantial commercial growth. This growth has required the construction of new water facilities as well the improvement of existing ones.

All but the Tahoe system are metered and each has a distinct customer use profile. For example the East Valley has the highest water use of the six systems with most of it being residential. In fact residential use in the East Valley is almost five times higher than that of the West Valley, the system with the next highest residential use. This is because the East Valley has 1,472 residential connections and West Valley only 233. The North County system has no residential customers while the Sunrise Estates system has no commercial customers. Because of these system differences, each system requires its own unique approach to conservation.

This Plan includes the following elements:

- Conservation goals
- Water Rights quantities
- Existing and planned conservation measures and incentives
- DCU use profile
- Conservation educational materials
- Regulatory Documents
- Drought plan

This plan was designed specifically for DCU and its customers and is compliant with Nevada Revised Statutes (NRS) sections 540.121 through 540.151. This includes Senate Bill 62

(passed in the 2005 Legislative Session) which added NRS 540.131.4 c to the existing statute. It also includes NRS 540 AB 331. Note that SB 62 wording is already included in the following statutes.

## **WATER CONSERVATION**

**NRS 540.121 “Supplier of water” defined.** As used in [NRS 540.121](#) to [540.151](#), inclusive, “supplier of water” includes, but is not limited to:

1. Any county, city, town, local improvement district, general improvement district and water conservancy district;
  2. Any water district, water system, water project or water planning and advisory board created by a special act of the Legislature; and
  3. Any other public or private entity,  
➤ that supplies water for municipal, industrial or domestic purposes. The term does not include a public utility required to adopt a plan of water conservation pursuant to [NRS 704.662](#).
- (Added to NRS by 1991, 520)

**NRS 540.131 Plan of water conservation: Procedure for adoption and updating of plan; review of plan by Section; joint plans permitted by certain suppliers; duties of local governing body.**

1. Except as otherwise provided in subsection 5, each supplier of water which supplies water for municipal, industrial or domestic purposes shall, on or before July 1, 1992, adopt a plan of water conservation based on the climate and the living conditions of its service area in accordance with the provisions of [NRS 540.141](#), and shall update the plan pursuant to paragraph (c) of subsection 4. The provisions of the plan must apply only to the supplier’s property and its customers. The supplier of water shall submit the plan to the Section for review by the Section pursuant to subsection 3.

2. As part of the procedure of adopting a plan, the supplier of water shall provide an opportunity for any interested person, including, but not limited to, any private or public entity that supplies water for municipal, industrial or domestic purposes, to submit written views and recommendations on the plan.

3. The plan must be reviewed by the Section within 30 days after its submission and approved for compliance with this section before it is adopted by the supplier of water.

4. The plan:

(a) Must be available for inspection by members of the public during office hours at the offices of the supplier of water;

(b) May be revised from time to time to reflect the changing needs and conditions of the service area. Each such revision must be made available for inspection by members of the public; and

(c) [Must be updated every 5 years and comply with the requirements of this section and NRS 540.141.](#)

5. Suppliers of water:

(a) Who are required to adopt a plan of water conservation pursuant to this section; and

(b) Whose service areas are located in a common geographical area,

➤ may adopt joint plans of water conservation based on the climate and living conditions of that common geographical area. Such a plan must comply with the requirements of this section and [NRS 540.141](#).

6. The board of county commissioners of a county, the governing body of a city and the town board or board of county commissioners having jurisdiction of the affairs of a town shall:

(a) Adopt any ordinances necessary to carry out a plan of conservation adopted pursuant to this section which applies to property within its jurisdiction;

(b) Establish a schedule of fines for the violation of any ordinances adopted pursuant to this subsection; and

(c) Hire such employees as it deems necessary to enforce the provisions of any ordinances it adopts pursuant to this subsection.

(Added to NRS by 1991, 520; A [2005, 2570](#))

**NRS 540.141 Required provisions of plan or joint plan of water conservation; review by Section.**

1. A plan or joint plan of water conservation submitted to the Section for review must include provisions relating to:

(a) Methods of public education to:

(1) Increase public awareness of the limited supply of water in this State and the need to conserve water.

(2) Encourage reduction in the size of lawns and encourage the use of plants that are adapted to arid and semiarid climates.

(b) Specific conservation measures required to meet the needs of the service area, including, but not limited to, any conservation measures required by law.

(c) The management of water to:

(1) Identify and reduce leakage in water supplies, inaccuracies in water meters and high pressure in water supplies; and

(2) Where applicable, increase the reuse of effluent.

(d) A contingency plan for drought conditions that ensures a supply of potable water.

(e) A schedule for carrying out the plan.

(f) Measures to evaluate the effectiveness of the plan.

2. A plan or joint plan submitted for review must be accompanied by an analysis of the feasibility of charging variable rates for the use of water to encourage the conservation of water.

3. The Section shall review any plan or joint plan submitted to it within 30 days after its submission and approve the plan if it is based on the climate and living conditions of the service area and complies with the requirements of this section.

4. The Chief may exempt wholesale water purveyors from the provisions of this section which do not reasonably apply to wholesale supply.

(Added to NRS by 1991, 521; A [2005, 2571](#))

**NRS 540.151 Supplier of water required to adopt plan to provide certain incentives; procedure for adoption of plan; adoption of joint plans permitted.**

1. Except as otherwise provided in subsection 5, each supplier of water which supplies water for municipal, industrial or domestic purposes shall adopt a plan to provide incentives:

(a) To encourage water conservation in its service area;

(b) To retrofit existing structures with plumbing fixtures designed to conserve the use of water; and

(c) For the installation of landscaping that uses a minimal amount of water.

↪ The supplier of water may request assistance from the Section to develop its plan.

2. As part of the procedure of adopting a plan, the supplier of water shall provide an opportunity for any interested person to submit written views and recommendations on the plan.

3. The supplier of water shall file a copy of the plan with the Section for informational purposes.

4. The plan:

(a) Must be available for inspection by members of the public during office hours at the offices of the supplier of water; and

(b) May be revised from time to time to reflect the changing needs and conditions of the service area. Each such revision must be made available for inspection by members of the public.

5. Suppliers of water:

(a) Who are required to adopt a plan for incentives pursuant to this section; and

(b) Whose service areas are located in a common geographical area,

↪ may adopt joint plans.

(Added to NRS by 1991, 522; A [2005, 2571](#))

The following are the AB 331 amended Statutes :

NRS 540.131 is hereby amended to read as follows:

1. Except as otherwise provided in subsection 5, each supplier of water which supplies water for municipal, industrial or domestic purposes shall, on or before July 1, 1992, adopt a plan of water conservation based on the climate and the living conditions of its service area in accordance with the provisions of NRS 540.141, and shall update the plan pursuant to paragraph (c) of subsection 4. The provisions of the plan must apply only to the supplier's property and its customers. The supplier of water shall submit the plan to the Section for review by the Section pursuant to subsection 3.

2. As part of the procedure of adopting a plan, the supplier of water shall provide an opportunity for any interested person, including, but not limited to, any private or public entity that supplies water for municipal, industrial or domestic purposes, to submit written views and recommendations on the plan.

3. The plan must be reviewed by the Section within 30 days after its submission and approved for compliance with this section *and NRS 540.141* before it is adopted by the supplier of water.

4. The plan:

(a) Must be available for inspection by members of the public during office hours at the offices of the supplier of water;

(b) May be revised from time to time to reflect the changing needs and conditions of the service area. Each such revision must be made available for inspection by members of the public; and

(c) Must be updated every 5 years and comply with the requirements of this section and NRS 540.141.

5. Suppliers of water:

(a) Who are required to adopt a plan of water conservation pursuant to this section; and

(b) Whose service areas are located in a common geographical area, may adopt joint plans of water conservation based on the climate and living conditions of that common geographical area. Such a plan must comply with the requirements of this section and NRS 540.141.

6. The board of county commissioners of a county, the governing body of a city and the town board or board of county commissioners having jurisdiction of the affairs of a town shall:

(a) Adopt any ordinances necessary to carry out a plan of conservation adopted pursuant to this section which applies to property within its jurisdiction;

(b) Establish a schedule of fines for the violation of any ordinances adopted pursuant to this subsection; and

(c) Hire such employees as it deems necessary to enforce the provisions of any ordinances it adopts pursuant to this subsection.

NRS 540.141 is hereby amended to read as follows:

1. A plan or joint plan of water conservation submitted to the Section for review must include provisions relating to:

(a) Methods of public education to:

(1) Increase public awareness of the limited supply of water in this State and the need to conserve water.

(2) Encourage reduction in the size of lawns and encourage the use of plants that are adapted to arid and semiarid climates.

(b) Specific conservation measures required to meet the needs of the service area, including, but not limited to, any conservation measures required by law.

(c) The management of water to:

(1) Identify and reduce leakage in water supplies, inaccuracies in water meters and high pressure in water supplies; and

(2) Where applicable, increase the reuse of effluent.

(d) A contingency plan for drought conditions that ensures a supply of potable water.

(e) A schedule for carrying out the plan **[.] or joint plan.**

(f) Measures to evaluate the effectiveness of the plan **[.] or joint plan.**

***(g) For each conservation measure specified in the plan or joint plan, an estimate of the amount of water that will be conserved each year as a result of the adoption of the plan or joint plan, stated in terms of gallons of water per person per day.***

2. A plan or joint plan submitted for review must be accompanied by an analysis of **[the]** :

***(a) The*** feasibility of charging variable rates for the use of water to encourage the conservation of water.

***(b) How the rates that are proposed to be charged for the use of water in the plan or joint plan will maximize water conservation, including, without limitation, an estimate of the manner in which the rates will affect consumption of water.***

3. The Section shall review any plan or joint plan submitted to it within 30 days after its submission and approve the plan if it is based on the climate and living conditions of the service area and complies with the requirements of this section.

4. The Chief may exempt wholesale water purveyors from the provisions of this section which do not reasonably apply to wholesale supply.

***5. To the extent practicable, the State Engineer shall provide on his Internet website a link to the plans and joint plans that are submitted for review. In carrying out the provisions of this subsection, the State Engineer is not responsible for ensuring, and is not liable for failing to ensure, that the plans and joint plans which are provided on his Internet website are accurate and current.***

The plan is available for public inspection at the following location:

**Douglas County  
1594 Esmeralda Ave, Room 202  
Minden, Nevada  
(775) 782-6235**

Public comments about this plan are encouraged. Written comments may be sent to the address above.

The following are the DCU conservation goals. Some of these goals involve ongoing efforts and others are one-time projects that will improve DCU's ability to manage available water. Project related goals will be revised or replaced by new goals as the conservation plan is periodically reviewed.

### **1.1 Plan Revision**

This Conservation plan will be reviewed and revised as needed every five (5) years. Revisions could include updated system profile data and charts, new conservation goals, well information, rate changes and any other pertinent conservation related changes that have occurred during the previous five years.

### **1.2 Reduction in Lawn Size**

Although DCU has no authority to institute codes and/or ordinances, one of the primary goals of this plan is to encourage a reduction in lawn size. Currently there is no County ordinance that limits lawn size; however there are existing regulations (Consolidated Development Code, Title 20.694) that govern where turf can be installed. For example turf is not allowed in any space measuring less than four feet in width or length. Turf is also not allowed in areas with a slope greater than 20 percent (1:5). Suggestions regarding lawn size and irrigation can be found in Appendices A and B.

### **1.3 Effluent Use**

Goal 5.15, Policy 5.15.02 in Chapter 5 of the Douglas County Master Plan states:

*“Treated effluent will be used to replace supplemental and non-supplemental groundwater pumped for irrigation purposes where feasible.”*

DCU is currently working on system improvements that will allow for effluent storage. The treated effluent will be used for agricultural applications within the Minden/Gardnerville area. The project is expected to be completed within 2007.

### **1.4 New Conservation Programs**

Goal 5.14, Policy 5.14.02 in Chapter 5 of the Douglas County Master Plan states:

*“Water conservation programs should be developed and instituted as necessary to reduce municipal demands.”*

### **1.5 Conservation Plan Implementation Schedule**

The conservation measures and incentives in this plan will be implemented according to the following schedule (see section 5 for detailed descriptions of incentives and measures included in the schedule):



**Table 1.1**

Plan Implementation Schedule

	2008	2009	2010
<b>Incentives</b>			
Conservation Education	Implement		
Water Ordinance amended		Implement	
<b>Measures</b>			
Effluent Use	Implement		
Creation of Conservation Budget		Implement	
Appointment of Conservation Specialist		Implement	
Formation of Conservation Committee		Implement	

The annual production audit will help determine if the schedule needs to be adjusted to accommodate the implementation of new measures or incentives or the discontinuation of old ones.

## 1.6 Plan Review and Metrics

General benchmarks have been established by which the effectiveness of this conservation plan may be measured. Appendix H contains these benchmarks taken from the Environmental Protection Agency (EPA) website for estimating residential water use. These benchmarks were used in Section 2.5 to determine the ranges of conservation expected for estimated plan participation. Once the plan has been implemented, the effectiveness of measures and incentives can be measured by comparing the 2005 gallon per capita per day (gpcd) usage (230 gpcd) with up-to-date usage. This will require that the latest metered residential use be divided by up-to-date persons per household census data. Section 2.5 discusses potential conservation amounts.

**END OF SECTION**

## SECTION 2 – WATER USE PROFILE AND FORECAST

This section outlines a profile of water production and use as well as a quantitative description of the MVWD water system that will include the following:

- Water rights information
- Existing supply sources and their production
- System water use profile with customer classifications and unaccounted for water
- Water use forecast using projected population growth

The purpose of this section is to compare water sources, with demand and establish a basis for conservation measures and incentives.

### 2.1 Water Rights

2.1.1 Ground Water Rights. Table 3.3 is a summary of current ground water right amounts held by DCU. The information in this table comes from the Water Rights Drawings created by DCU. Since the number of permits and other information is so extensive, it is not included here.

**TABLE 2.1**

Summary of DCU Ground Water Rights

System	Duty (AFA)
Cave Rock / Skyland	451.188
China Springs	58.54
East Valley	3,081.483
Fairgrounds	37.726
Fish Springs Fire Station	2.24
Genoa	429.351
Jobs Peak Ranch	147.840
Lampe Park	96.080
Mountain Meadows	540.300
North County	362.063
Sheridan Acres	122.112
Sierra Country Estates	29.12
Sunrise Estates	51.960
Topaz Lake Park	24.496
Uppaway	46.965
W R Technology Park	102.066
Walley's Hot Springs	649.705
Zephyr	271.340
<b>Total</b>	<b>6,504.576</b>

At this time the water rights listed above meet the demand of DCU customers. For example the total water rights for the East Valley system are 3,081.483 AFA. In 2005 the East Valley system consumption, including unaccounted-for water, was 1,131.85 AFA.

## 2.2 Supply Sources, Production and Storage

### Supply Sources and Production

Table 2.2 shows 2005 average monthly demand and peak demand for active wells in the DCU system.

**TABLE 2.2**

Monthly Well Pumping Summary for DCU 2005

#### **WEST VALLEY SYSTEM**

<b>Name</b>	<b>Average Monthly Demand (gal)</b>	<b>Peak Demand (gal)</b>	<b>Month of Peak Demand</b>
Sierra Shadows	842,147	2,667,000	February
Genoa Lakes #1	276,750	1,184,000	December
Genoa Lakes #2	2,319,500	7,785,000	May
Walley's #2	5,925,167	17,671,000	August
Montaña #1	Not used in 2005	-	-
Montaña #2	Not used in 2005	-	-

#### **EAST VALLEY SYSTEM**

<b>Name</b>	<b>Average Monthly Demand (gal)</b>	<b>Peak Demand (gal)</b>	<b>Month of Peak Demand</b>
Airport Well #1	2,275,417	9,261,000	July
South Airport Well	22,350,167	50,092,000	August
North Clapham	5,598,083	7,965,000	November
Heybourne	356,750	2,205,000	July
NVWWTP*	3,667	9,000	Oct, Nov

\*This well only supplies non-potable water for the wastewater treatment plant.

#### **SUNRISE ESTATES SYSTEM**

<b>Name</b>	<b>Average Monthly Demand (gal)</b>	<b>Peak Demand (gal)</b>	<b>Month of Peak Demand</b>
Sunrise Estates #1	5,583	38,000	March
Sunrise Estates #2	1,488,667	7,586,000	April

#### **LAKE TAHOE SYSTEM**

<b>Name</b>	<b>Average Monthly Demand (gal)</b>	<b>Peak Demand (gal)</b>	<b>Month of Peak Demand</b>
Lake Tahoe	6,689,500	12,385,000	July

## Section 2 – Water Use Profile and Forecast

### NORTH COUNTY SYSTEM

Name	Average Monthly Demand (gal)	Peak Demand (gal)	Month of Peak Demand
North County #1	1,679,833	2,927,000	July
North County #2	177,417	1,237,000	December
Topsy Fill Station	4,083	21,000	November

### FOOTHILL SYSTEM

Name	Average Monthly Demand (gal)	Peak Demand (gal)	Month of Peak Demand
Sheridan #2	4,412,467	22,977,000	February
Jobs Peak #1	2,124,333	6,145,000	August
Jobs Peak #2	111,750	1,333,000	May

### FAIRGROUNDS WELL

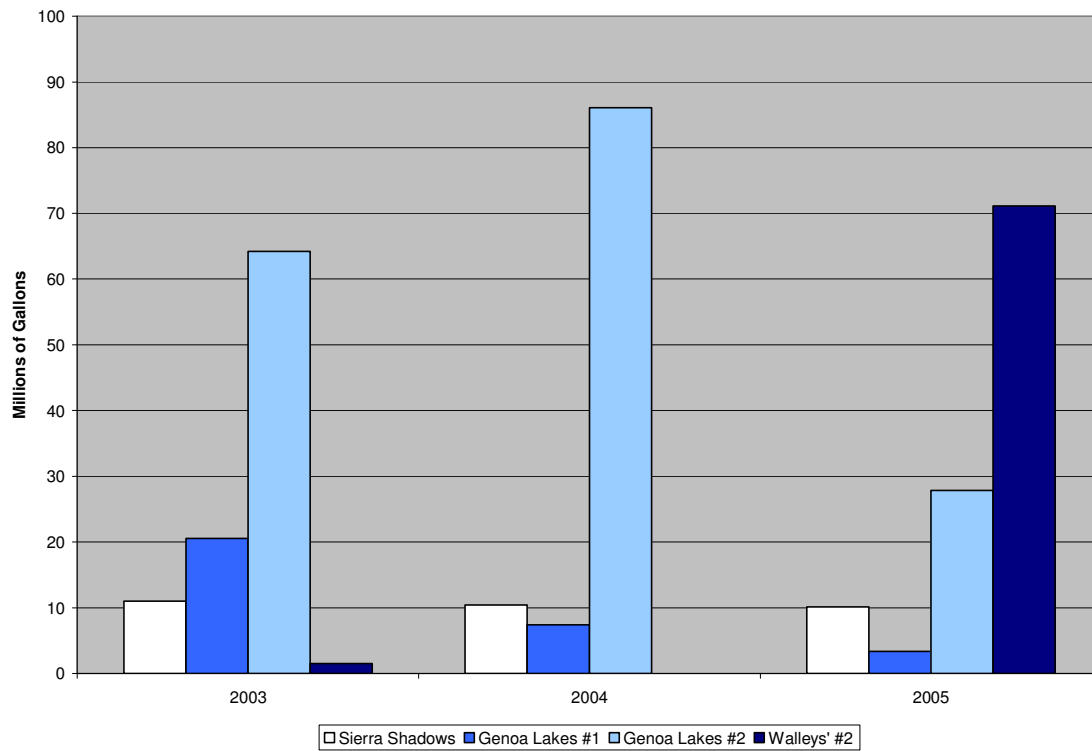
Name	Average Monthly Demand (gal)	Peak Demand (gal)	Month of Peak Demand
Fairgrounds #1	315,250	708,000	July

The East Valley wells shown in Table 2.1 have the highest production amounts because they serve the area with the greatest concentration of residential users in the DCU system. The South Airport well has the highest production of any DCU well with an average monthly demand of 22 million gallons per month, with a peak demand of 50 million gallons (2005).

Figures 2.1 through 2.7 show the annual contributions of wells in each of the sub-systems for the years 2003 through 2005.

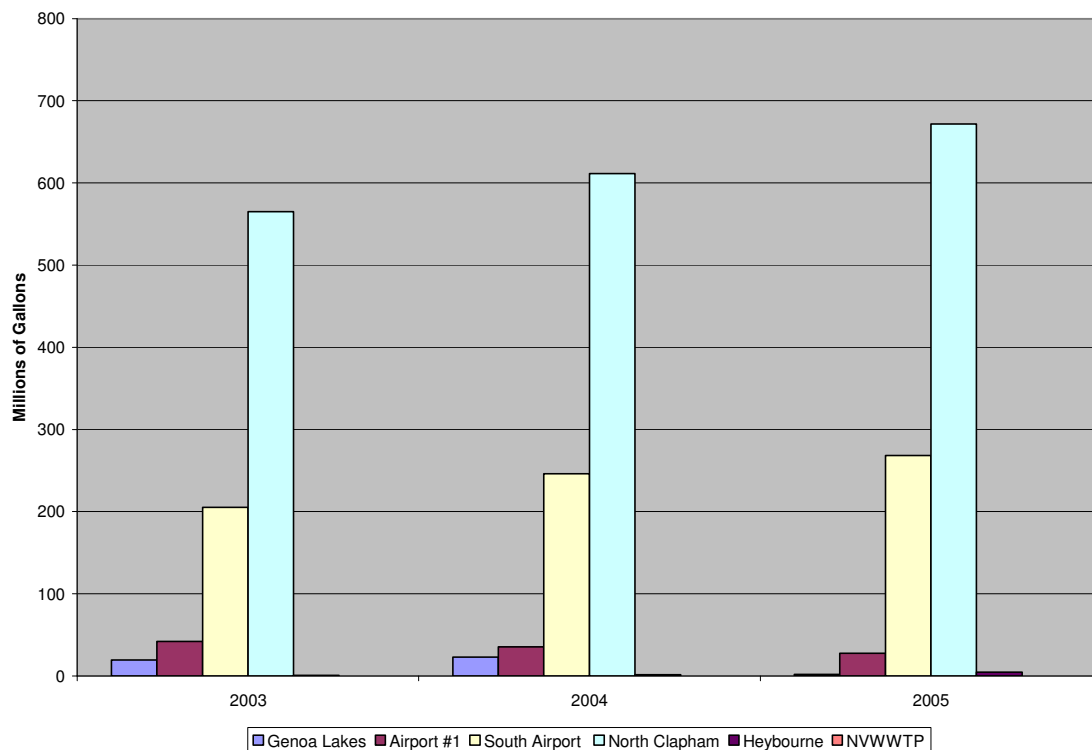
**FIGURE 2.1**

Annual Well Contributions – West Valley 2003 - 2005



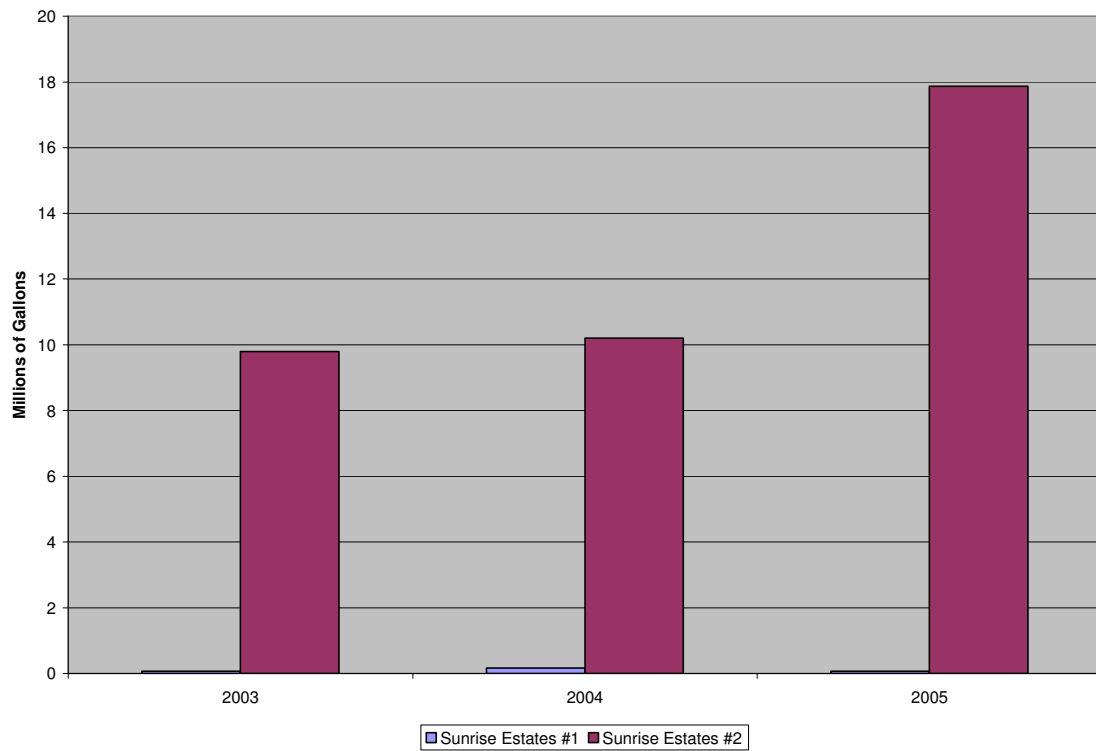
**FIGURE 2.2**

Annual Well Contributions – East Valley 2003 – 2005



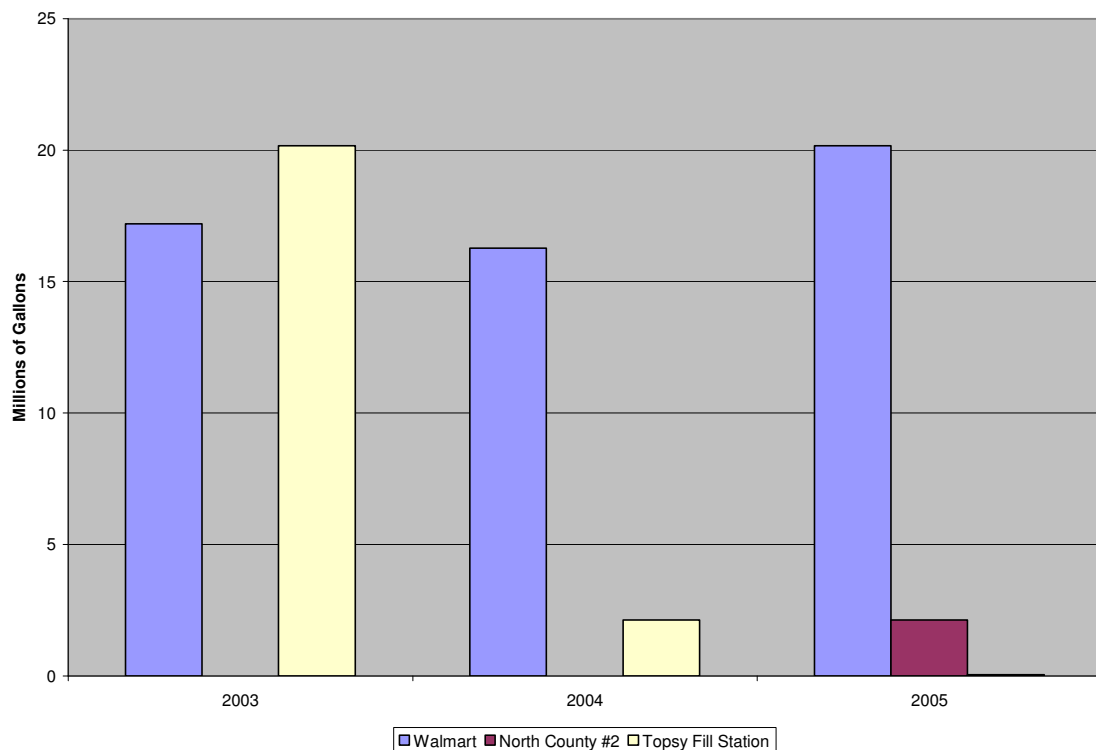
**FIGURE 2.3**

Annual Well Contributions – Sunrise Estates 2003 – 2005



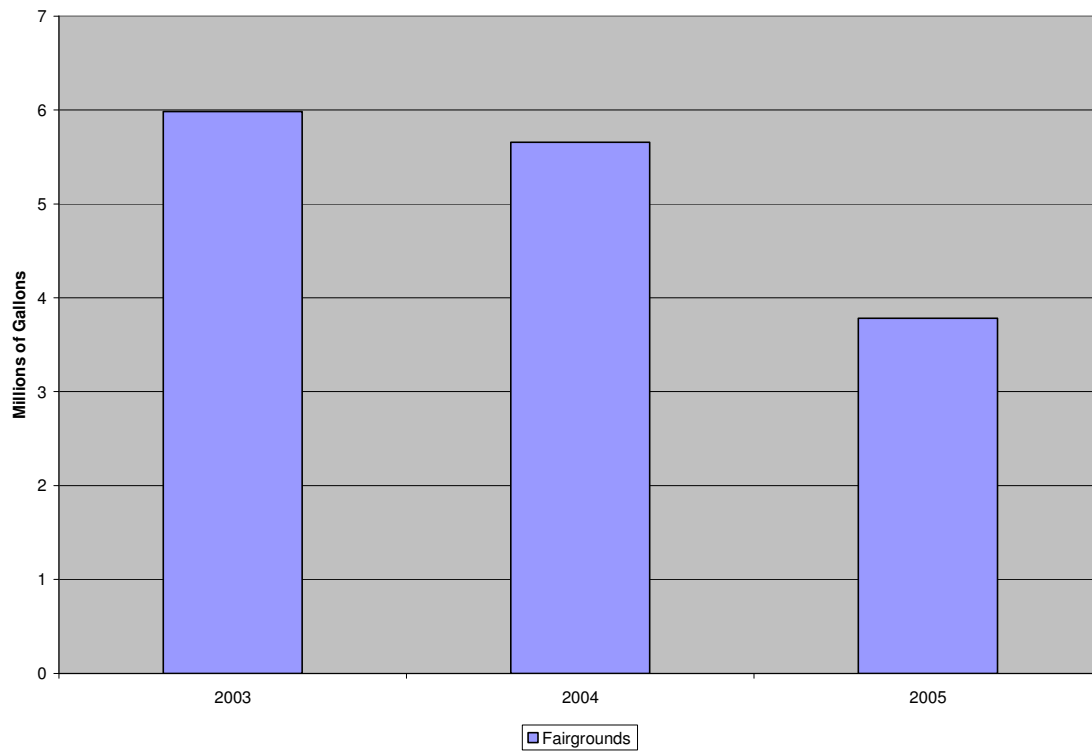
**FIGURE 2.4**

Annual Well Contributions – North County 2003 – 2005



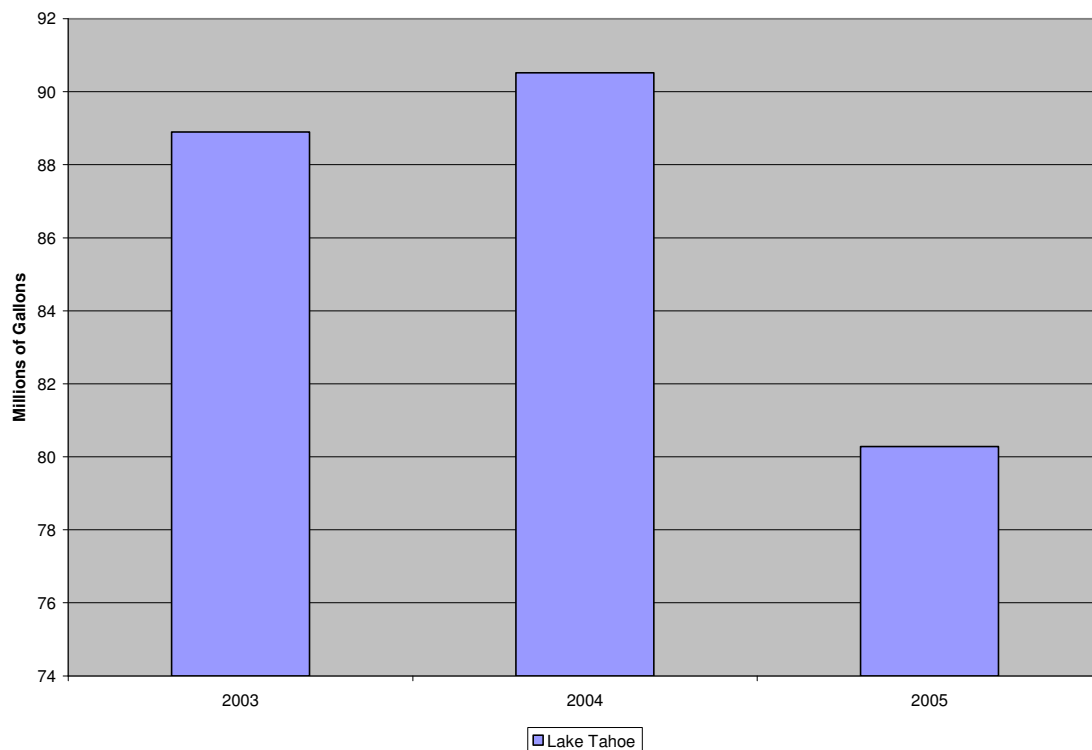
**FIGURE 2.5**

Annual Well Contributions – Fairgrounds 2003 – 2005



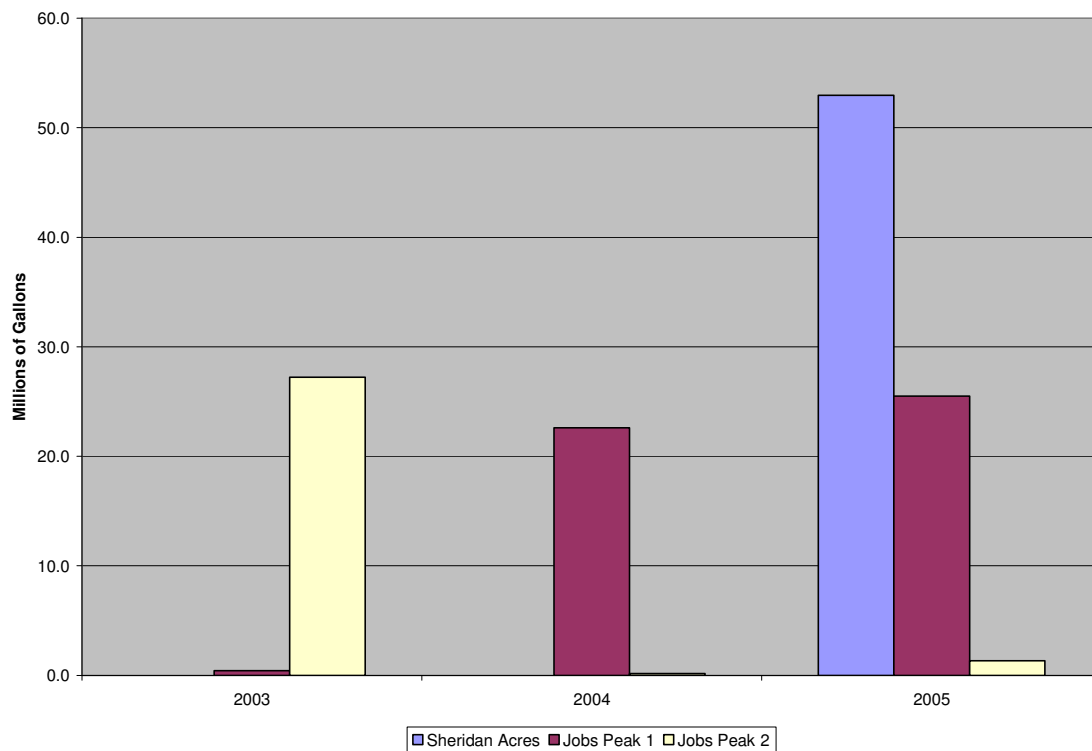
**FIGURE 2.6**

Annual Well Contributions – Lake Tahoe 2003 – 2005



**FIGURE 2.7**

Annual Well Contributions – Foothill 2003 – 2005



The figures show that well demand increased in the West and East Valley, Sunrise Estates, and North County service areas while it decreased at the Fairgrounds and Lake Tahoe.

### Storage

Table 2.3 includes the 21 DCU storage tanks and their capacities. Average daily water use in 2005, including unaccounted-for water, was 1,658,921 per day. The total storage amount shows that in the event a disaster disables portions of the DCU system, there is enough existing storage for approximately seven days of average water use (according to 2005 usage).



**TABLE 2.3**

DCU Storage Tanks and Capacities

NO.	TANK NAME	CAPACITY (gal)
1	China Springs	325,900
2	Fairgrounds	200,000
3	Sierra Shadows	410,000
4	Genoa Lakes	730,000
5	Eagle Ridge	307,800
6	Sheridan Acres	298,000
7	Job's Peak	555,200
8	Jack's Valley/North County	2,000,000
9	Canyon Creek - Upper	1,034,186
10	Canyon Creek - Lower	500,000
11	Airport	300,000
12	Johnson Lane	1,584,320
13	Skyline	507,582
14	Mountain View	600,800
15	ZWUD	626,000
16	Lower Cave Rock	198,000
17	Upper Cave Rock	216,000
18	Lakeridge	300,000
19	Hidden Woods	124,000
20	Skyland	850,000
21	Uppaway	135,000
<b>Total</b>		<b>11,802,788</b>

## 2.3 Water Use Profile

DCU provides water for the following types of water consumers:

- Residential
- Commercial
- Industrial
- Agricultural
- Hydrants, including construction use
- County
- Cemeteries
- Miscellaneous

Metered customers are classified as follows:

- Residential
- Commercial
- Irrigation
- Hauled
- Fill Station

Table 2.4 shows the 2005 total amounts of water consumed by each of these classes.

**TABLE 2.4**

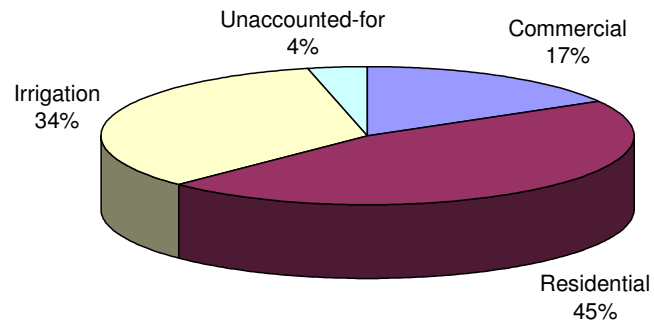
Water Consumed in 2005 (kgal)

<b>Class</b>	<b>West Valley</b>	<b>East Valley</b>	<b>Sunrise Estates</b>	<b>North County</b>	<b>Fair-grounds</b>	<b>Lake Tahoe*</b>	<b>Totals</b>
Residential	51,493	301,745	8,587	-	5	56,192	418,022
Commercial	18,868	26,139	-	15,640	273	16,055	76,975
Irrigation	37,998	32,887	-	5,005	1,978	-	77,868
Hauled	-	-	-	1,691	416	-	416
Fill Station	-	-	-	-	410	-	410
Unaccounted-for	4,007	8,045	2,384	-	701	8,027	31,815
<b>Total</b>	<b>112,366</b>	<b>368,816</b>	<b>10,971</b>	<b>22,336</b>	<b>3,783</b>	<b>80,274</b>	<b>605,506</b>

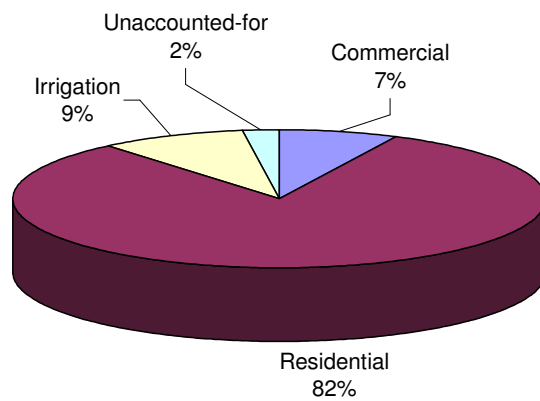
\*Lake Tahoe connections are unmetered therefore the Residential, Commercial and Unaccounted-for numbers were estimated to be 70, 20, and 10% (respectively) of the total amount pumped.

The unaccounted-for water listed in Table 2.4 is the difference between the amount pumped and the amount charged to customers (metered). Each of the sub-systems has a different percentage of unaccounted-for water with some of the systems being below the industry standard of ten percent. This is shown in Figures 2.7 through 2.11. Note that the Foothill system is not included here. It is currently unmetered with customers being charged a flat rate. Meters will soon be installed in this system. The China Springs system is also not shown. This is because a well failure has required that water be hauled to a storage tank supplying the system. Water hauled to China Springs has been supplied by wells in the Fairgrounds and Sunrise Estates systems.

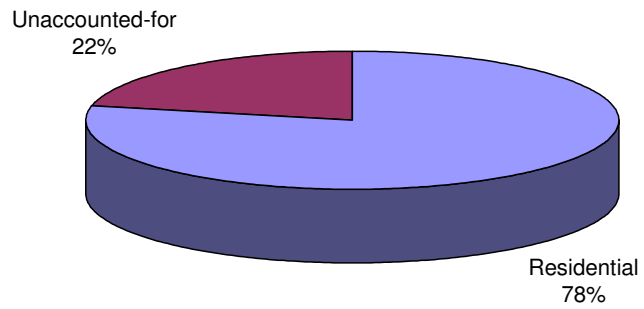
**FIGURE 2.7**  
West Valley Water Use, 2005



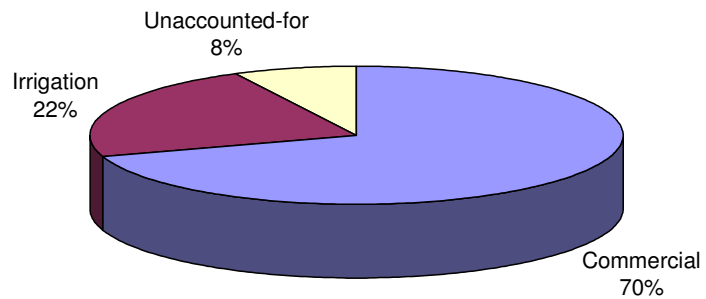
**FIGURE 2.8**  
East Valley Water Use, 2005



**FIGURE 2.8**  
Sunrise Estates Water Use, 2005

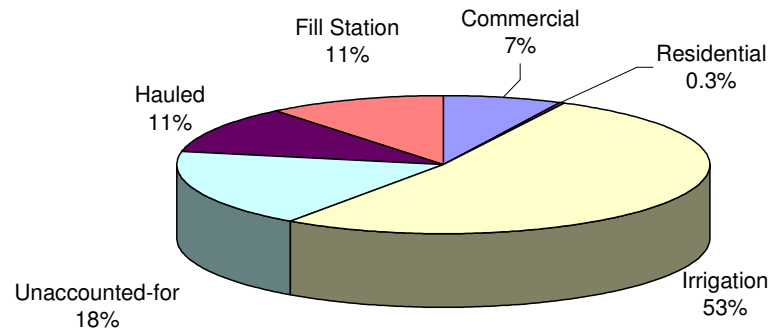


**FIGURE 2.9**  
North County Water Use, 2005



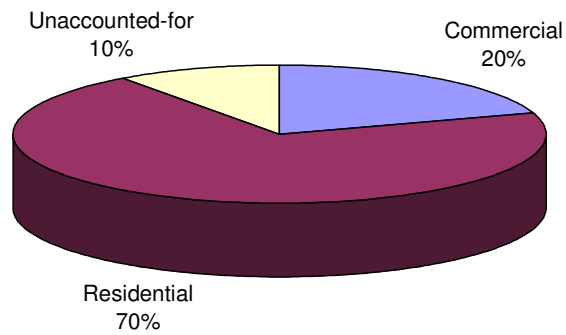
**FIGURE 2.10**

Fairgrounds Water Use, 2005



**FIGURE 2.11**

Lake Tahoe Water Use, 2005



Causes for water being unaccounted for are numerous. Leaking mains, dead meters, under-registering meters, record keeping practices, un-metered uses, and multiple users on meters all contribute to the problem.

Since the West and East Valley systems have the highest concentration of residential customers, those systems are used to determine the average residential per gallon per capita per day usage (gpcd). According to the U.S. Census bureau the average number of persons per household in Douglas County in 2000 was 2.5. This amount is used to estimate the gpcd shown in Table 2.4. Note that the State average is 200 gpcd.

**TABLE 2.5**

Average Residential per capita per day use in 2005

System	Total 2005 Metered Use (kgal)	Number of Connections	gpcd
West Valley	51,493	223	253
East Valley	301,745	1,472	225

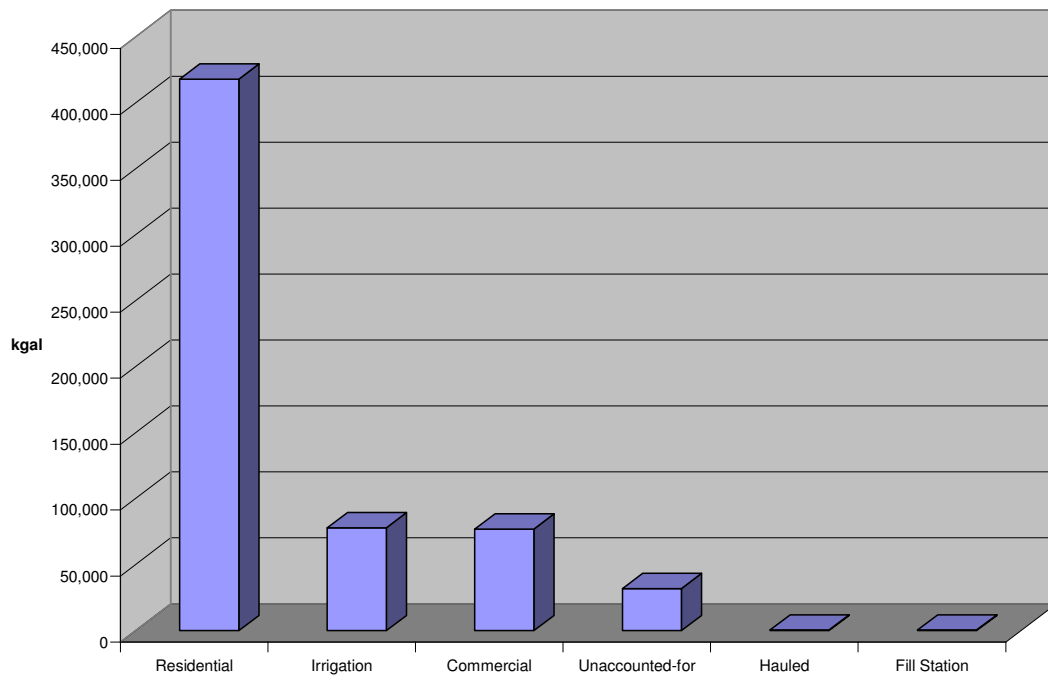
Table 2.3 shows that per capita use is 28 gallons per person per day higher in the West Valley than it is in the East Valley. This may be attributed to the fact that the average West Valley residence, including landscape, is larger than the average East Valley residence. It also may be because West Valley residential water rates are lower than the East Valley rates.

Figure 2.12 shows total water use for DCU in 2005. The chart emphasizes the importance of residential water conservation.

Figure 2.13 shows that the DCU total unaccounted-for water percentage is well below the industry standard of 10%. For this reason each sub-system was considered separately in order to determine the greatest source of unaccounted-for water and thereby establish a plan for its reduction.

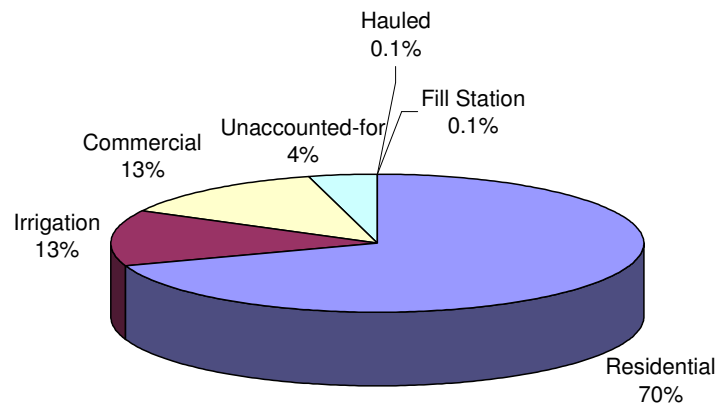
**FIGURE 2.12**

Douglas County Utilities Total Water Use 2005



**FIGURE 2.13**

Douglas County Utilities Total Water Use 2005



## 2.4 Water Demand Forecast

Population estimates by the U.S. Census Bureau indicate that Douglas County grew at an average rate of 2.4% per year between 2000 and 2005. A demand forecast was created by applying this rate to metered amounts for 2005 (the forecast does not account for water losses). Table 2.6 includes 20 years of projected metered totals for all DCU systems.

**TABLE 2.6**

Production Forecast 2005 – 2025 (kgal)

Year	Demand
2005	605,506
2006	618,112
2007	631,020
2008	644,238
2009	657,773
2010	671,633
2011	685,825
2012	700,359
2013	715,241
2014	730,480
2015	746,085
2016	762,064
2017	778,427
2018	795,183
2019	812,341
2020	829,910
2021	847,901
2022	866,325
2023	885,190
2024	904,508
2025	924,289

The forecast assumes that each customer class consumes the same percentage of the total amount each year. It also assumes that the Lake Tahoe system experiences no growth. It should also be noted that a 2.5% growth cap has been instituted in Douglas County.

## 2.5 Estimated Amount of Water Conserved Due to Measures and Incentives

Table 2.7 (See Appendix H) shows the range of residential use per person per day using the U.S. Census 2006 average persons per household estimate (2.5) for Douglas County.



**TABLE 2.7**

Range of Residential Water Use in Gallons per Day (EPA Estimates)

Use	Per Person (Low)	Per Person (High)
Toilets	6.4	48.00
Showers	7.50	75.00
Baths	6.00	10.00
Washing Machine	9.00	25.00
Dish Washer	1.00	4.50
Kitchen Faucet	1.00	15.00
Bathroom Faucet	1.00	9.00
Landscape	12.2	162.6
<b>Total</b>	<b>44.1</b>	<b>349.1</b>

Currently the average per person per day use in the DCU service area is approximately 230 gallons which is higher than the State average (200 gpcd). The application of residential conservation measures and incentives encouraged through education (see Section 5.5) could reduce this average. The per person usage range shown in Table 2.7 provides conservation benchmarks for residential water use and DCU is approximately at mid-range. An estimated conservation-initiated reduction of 50 gpcd (down to 180 gpcd) would place DCU residential water use at or below the State average. Table 2.8 shows a range of potential averages based on different customer participation levels.

**TABLE 2.8**

Residential Conservation Resulting from Education (East and West Valley Systems)

% of Users Consuming 190 gallons/day	New gpcd Average (gal)	Amount Conserved Annually (MG)
25	217.5	16.8
50	205.0	36.2
75	192.5	55.5

\*Table assumes level population

Table 2.8 assumes a population of 4,238 within the East and West Valley systems. This figure is developed by multiplying the total number of connections in those systems (1,695) by 2.5 (number of persons per household in Douglas County according to the U.S. Census). The East and West Valley systems were used because they have the greatest number of residential users and are representative of the entire DCU service area.

The amounts in Table 2.8 are what will be expected as a result of conservation education. A range is provided because it is difficult to determine the level of individual participation that will result from educational efforts.

It should also be noted that additional water will be conserved through effluent use. However the effluent (approximately 280,000 gpd) will be used for agricultural purposes and will not have any effect on residential, commercial, or industrial use.

## END OF SECTION

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## SECTION 3 – CONSERVATION INCENTIVES

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Conservation incentives by definition are those things that increase awareness and encourage conservation. There are three general categories of conservation incentives; Educational, Financial, and Regulatory. The following sections include examples of the three types of incentives.

### 3.1 Educational Conservation Incentives

3.1.1 Literature. Douglas County in conjunction with the University of Nevada Cooperative Extension has created conservation literature designed to address the specific needs of the Carson Valley. The literature is distributed twice per year, once around May 1 and again around August 1. An example of the pamphlets is included in Appendix A.

Water conservation related literature is available from many sources. One of the best may be the American Water Works Association (AWWA). The AWWA publishes a number of water conservation pamphlets that cover topics ranging from home fixture repair to water conserving landscapes. The University of Nevada Cooperative Extension also publishes conservation related literature containing landscaping information. Examples of AWWA and Extension pamphlets are in Appendix A.

There are several ways that DCU can distribute conservation literature. Many of the AWWA pamphlets are sized to fit in a number 10 envelop. These pamphlets can be mailed with customer billings or separately. Literature can also be distributed at public gatherings including include fairs, Boy Scout and Girl Scout activities and school events.

3.1.2 Internet. Websites can be used to provide conservation information. Some of the most informative conservation related websites were created by water purveyors in Nevada. These organizations include the Las Vegas Valley Water District, Southern Nevada Water Authority, and the Truckee Meadows Water Authority. These websites include information covering the following topics:

- Drought
- Watering schedules
- Landscaping
- Water saving appliances and fixtures

A list of these websites can be found in Appendix C.

3.1.3 School Visits. DCU can visit local schools and teach children about conservation. There are a number of water models available that can be used to do this. An example of one of these models is shown in figure 3.1. This water model was created by professors at the University of Nebraska but there are other sources through which such model may be obtained.

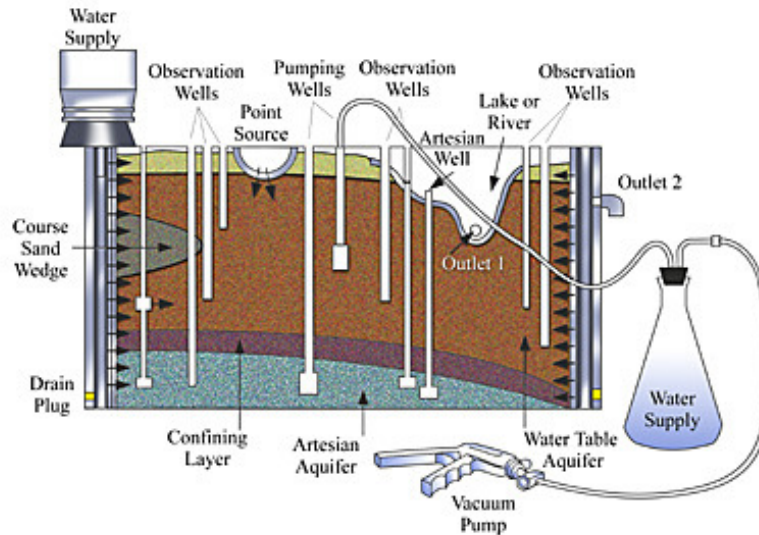
Additionally, the Douglas County school system has used a conservation program sponsored by the U.S. Department of Agriculture to teach children in grades first through fifth.

3.1.4 Education for Large Water Consumers. Some DCU customers consume large amounts of water as a matter of necessity. Examples of these customers include hotels, golf courses, manufacturing companies and even large homes. Schools and parks may also use large

amounts of water. DCU can encourage these entities to use water more efficiently by offering conservation training or performing audits that help pinpoint sources of potential waste. DCU can also sponsor courses offered by the Irrigation Association. These courses provide information on irrigation techniques including audits, design, installation and maintenance. Information for the Irrigation Association may be found at [www.irrigation.org](http://www.irrigation.org).

**FIGURE 3.1**

University of Nebraska Standard Ground Water Model



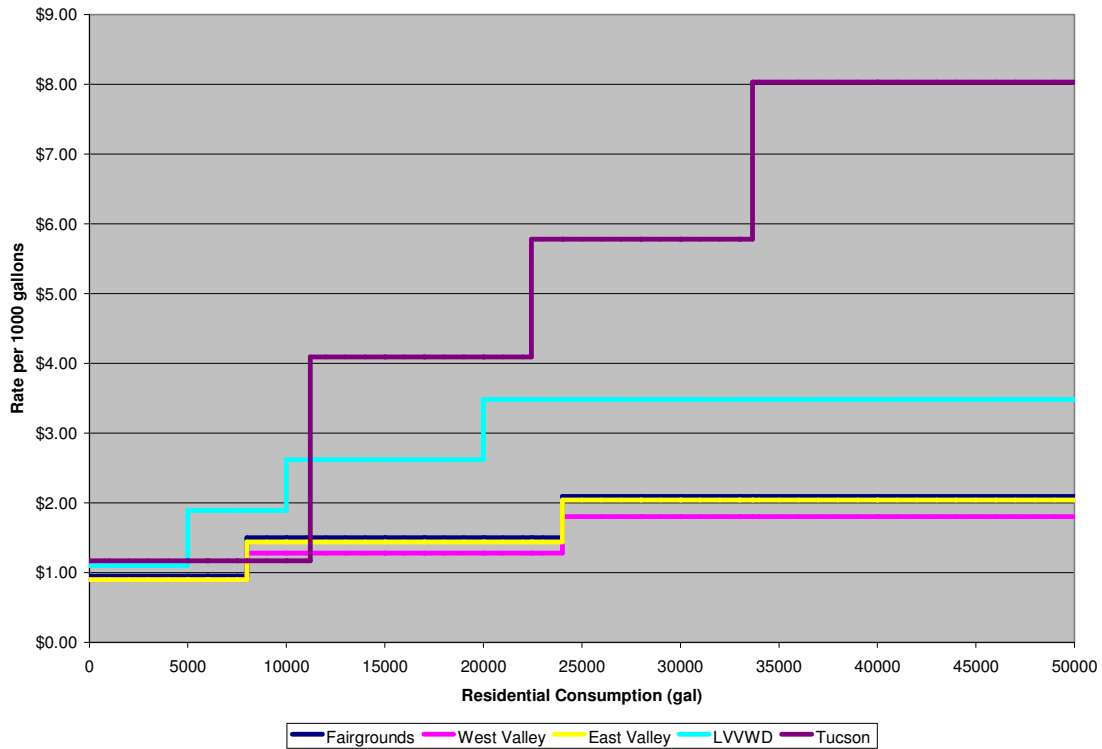
### 3.2 Financial Conservation Incentives

3.2.1 Rates. DCU uses an inclining block rate structure for most of its sub-systems. Inclining block rates increase with consumption which effectively encourages conservation. Generally speaking, DCU rates are divided into three classes; residential, commercial/industrial, and irrigation. Note that all of DCU's sub-systems have different rates. This is because each system has its own specific cost basis and the rates have been customized to reflect those costs. DCU's inclining block rates start with a fixed rate and then a triple-tiered structure; Tier 1 = 0 to 8,000 gallons, Tier 2 = 8001 to 24,000 gallons, Tier 3 = 24,001+. Although some of DCU's systems have flat rates those rates are high enough to encourage conservation. Appendix D contains rate schedules for each of the DCU sub-systems.

Figure 3.2 shows the marginal price curves for three DCU sub-systems. They are compared with curves from Las Vegas Valley Water District (LVVWD) and the Tucson, Arizona water system. The curves are shown together to illustrate the different approaches to rate-related conservation. Note that the Tucson curve starts at approximately the same level as the others but then increases in the second tier and remains higher than the others from that point forward.

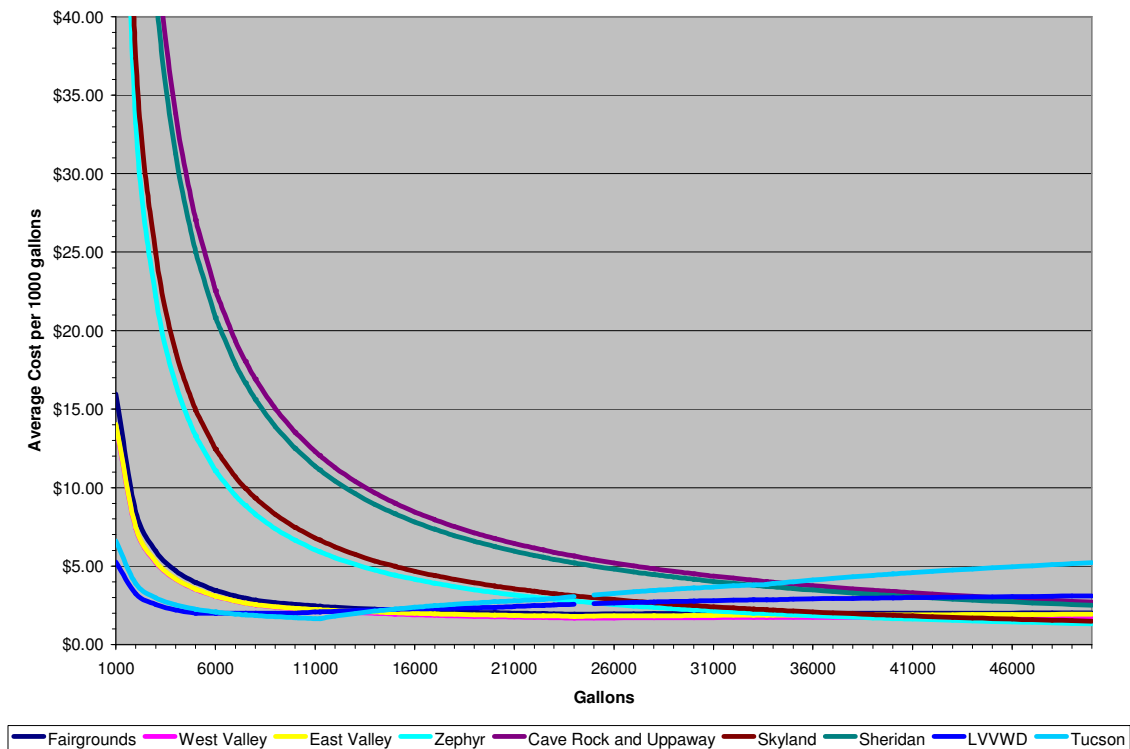
**FIGURE 3.2**

Marginal Price Curves for Douglas County Utility Systems, LVVWD and Tucson



**FIGURE 3.3**

Average Price per 1,000 gallons for Douglas County Utility Systems, LVVWD and Tucson



Although the marginal rates in Figure 3.1 show the price of water increasing with use, it is actually the average price per unit that has the greatest impact on conservation. Figure 3.3 shows the average price per thousand gallons for each system. Tucson's average price per thousand gallons increases at high consumption levels. DCU has three systems with tiered rates and five systems with fixed rates. It is interesting to note that both types of rates end up with the same average cost per thousand gallons at higher consumption levels. The fact that the fixed rate systems have a higher average cost at lower consumption levels probably neither encourages nor discourages conservation since the cost of the water is the same no matter how much is used.

Table 2.5 shows the different per capita per day amounts consumed by East Valley (225 gpcd) and West Valley (253 gpcd) customers. To a degree this may be a function of rates since West Valley water rates are lower than East Valley rates. Rates can be a great incentive to conserve water. However, high rates don't always motivate customers to conserve. Many water utilities have discovered that customers with above average incomes would not be motivated to conserve no matter how high water rates were. In those cases, educational and/or regulatory incentives may be more effective.

DCU is in the process of performing rate analysis for each of its systems. This is because current rates are not a reflection of costs or revenue needs. The new rates will reflect the costs of each individual system and are more likely to encourage conservation. Costs include operation, reserve account funding, and payment requirements for the system's past debts. Consideration will also be given to the industry standard that reasonable rates are  $\leq 1.5\%$  of the median household income.

**3.2.2 Savings from Efficient Plumbing Fixtures.** Even though the Federal Energy Policy Act (FEPA) has mandated the manufacture and installation of efficient plumbing fixtures since 1994, there are still inefficient fixtures and appliances in use. Table 3.3 shows the potential savings from efficient fixtures.

**TABLE 3.3**

Potential Water Savings

Fixture*	Fixture Capacity	WATER USE (gpd)		WATER SAVINGS (gpd)	
		Per Capita	Per Household**	Per Capita	Per Household**
<b><i>Toilets***</i></b>					
Efficient	1.5 gal/flush	6.0	16.2	N/A	N/A
Low-Flow	3.5 gal/flush	14.0	37.8	8.0	21.6
Conventional	5.5 gal/flush	22.0	59.4	16.0	43.2
Conventional	7.0 gal/flush	28.0	75.6	22.0	59.4
<b><i>Showerheads†§</i></b>					
Efficient	2.5 [1.7] gal/min	8.2	22.1	N/A	N/A
Low-Flow	3.0 to 5.0 [2.6] gal/min	12.5	33.8	4.3	11.7
Conventional	5.0 to 8.0 gal/min	16.3	44.0	8.1	22.0
<b><i>Faucets†§</i></b>					
Efficient	2.5 [1.7] gal/min	6.8	18.4	N/A	N/A
Low-Flow	3.0 [2.0] gal/min	8.0	21.6	1.2	3.2
Conventional	3.0 to 7.0 gal/min	13.2	36.6	6.4	17.2
<b><i>Fixtures Combined</i></b>					
Efficient	N/A	21.0	56.7	N/A	N/A
Low-Flow	N/A	34.5	93.2	13.4	36.4
Conventional	N/A	54.5	147.2	33.5	90.4

Source: Amy Vickers, "Water Use Efficiency Standards for Plumbing Fixtures: Benefits of National Legislation", *American Water Works Association Journal*, Vol 82 (May 1990): 53

\*Efficient = post-1994, Low-Flow = post-1980, Conventional = pre-1980; \*\*Assumes 2.7 persons per household.

\*\*\*Assumes four flushes per person per day. Does not include losses through leakage.

†For showerheads and faucets: maximum rated fixture capacity [measured fixture capacity]. Measured capacity equals about 2/3 the maximum.

§Assumes 4.8 shower-use-minutes per person per day and 4.0 faucet-use-minutes per person per day.

The potential savings shown in table 3.3 could make a plumbing retrofit program feasible.

### 3.3 Regulatory Conservation Incentives

3.3.1 Codes and Ordinances. The Douglas County Consolidated Development Code includes both a landscape code and a water ordinance. The landscape code can be found in Chapter 20.694 and the water ordinance in Title 20, Appendix F (see Appendix I).

The water ordinance includes conditions under which service may be terminated for reasons of waste. It also establishes the County's right to restrict and apportion water during times of drought or any other emergency that threatens the water supply.

These documents are valuable resources for the prevention of waste. However as the County continues to grow, it will become necessary to establish an enforcement element in order to insure code compliance.

3.3.2 Potential Savings from Conservation Measures and Incentives. Potential conservation related consumer savings is shown in Table 3.4. The table shows estimated water savings resulting from the application of mandatory conservation measures shown in Table 4.3.

**TABLE 3.4**

Estimated Water Savings from Mandatory Measures (assumes 100% participation)

<b>Mandatory Measure</b>	<b>Savings (gpcd)</b>	<b>*Total Annual Savings Range (\$)</b>
Low flow faucets (#1)	12.48	6,969 – 16,185
Ultra Low Flow Toilets (#2)	7.07	3,948 – 9,169
Landscape/Outdoor (#3 - #8)	18.56	10,365 – 24069
<b>Totals</b>	<b>38.11</b>	<b>21,282 – 49,423</b>

\*Assumes 100% participation by 1,700 customers. Savings amounts are calculated using current tiered rates. Ranges are calculated using the lowest tier from the system with the lowest rates and the highest tier from the system with the highest rates.

Currently three systems in the DCU service area have tiered rates for residential customers. Most of DCU's residential customers are in these systems. It should be noted that DCU is in the process of creating new rates to reflect current costs.

**END OF SECTION**

## SECTION 4 – CONSERVATION MEASURES

A conservation measure is a device or practice that reduces water consumption. Conservation measures are divided into two fundamental categories; 1, Hardware or equipment and 2, Behavior or management practices. Examples of hardware measures include low-volume toilets and irrigation rain sensors. Examples of behavioral measures include not using the toilet as a trash can and watering lawn less frequently.

Some conservation measures are mandated by state and/or federal laws and others are voluntarily implemented by local water purveyors and/or customers. This section discusses both.

### 4.1 Plumbing Standards

The most recent federal plumbing standards (table 4.1) are included here since these standards are applicable to the DCU service area. It is valuable to include California's standards for reference since in most cases California's requirements are more stringent. The comparison infers that there are plumbing fixtures available that exceed federal efficiency requirements and offer consumers alternatives that further improve conservation efforts.

**TABLE 4.1**

Federal and California Plumbing Standards

Device	FEDERAL ENERGY POLICY ACT (FEPA)		CALIFORNIA	
	Manufacture	Effective Date	Sale and Installation	Effective Date
Shower Heads	2.5 gpm*	1/1/94	2.5 gpm	3/20/92
Lavatory Faucets	2.5 gpm	1/1/94	2.2 gpm	3/20/92
Sink Faucets	2.5 gpm	1/1/94	2.2 gpm	3/20/92
Metering Faucets	*	1/1/94	†	7/1/92
Tub Spout Diverters	Not included in FEPA		0.1 to 0.3‡	3/20/92
Residential Toilets	1.6 gpf	1/1/94	1.6gpf	3/20/92
Flushometer Valves	1.6 gpf§	1/1/97	1.6 gpf	1/1/92
Commercial Toilets	1.6 gpf	1/1/97	1.6 gpf	1/1/94
Urinals	1.0 gpf	1/1/94	1.0 gpf	1/1/92

\* Gallons per minute.

\*\* 0.25 gal/cycle (pertains to maximum water delivery per cycle).

† Hot water maximum flow rate range from 0.25 to 0.75 gal/cycle and/or from 0.5 gpm to 2.5 gpm, depending on controls and hot water system.

‡ 0.1 (new), to 0.3 gpm (after 15,000 cycles of diverting).

§ Gallons per flush.

### 4.2 DCU Conservation Measures

**4.2.1 Reduction in Un-accounted-for Water.** Reducing unaccounted-for water can save millions of gallons a year as well as benefit DCU by reducing lost revenue.

Table 4.2 shows the unaccounted-for amounts for each system in 2005. In general DCU has done well in keeping unaccounted-for water percentages relatively low. However this is an aspect of conservation that can always improve. In this system there are two approaches that can be taken to reduce losses. One is to concentrate on the sub-system that has a higher percentage of unaccounted-for water than any of the other sub-systems. The other is to focus on the sub-system with the highest amount of unaccounted-for water.

The second approach is more difficult because it may involve the largest of the sub-systems. Whatever the approach, the effort should be proactive. Repairing obvious leaks doesn't always reduce the amount of unaccounted-for water since leaks aren't the only source of losses.

**TABLE 4.2**

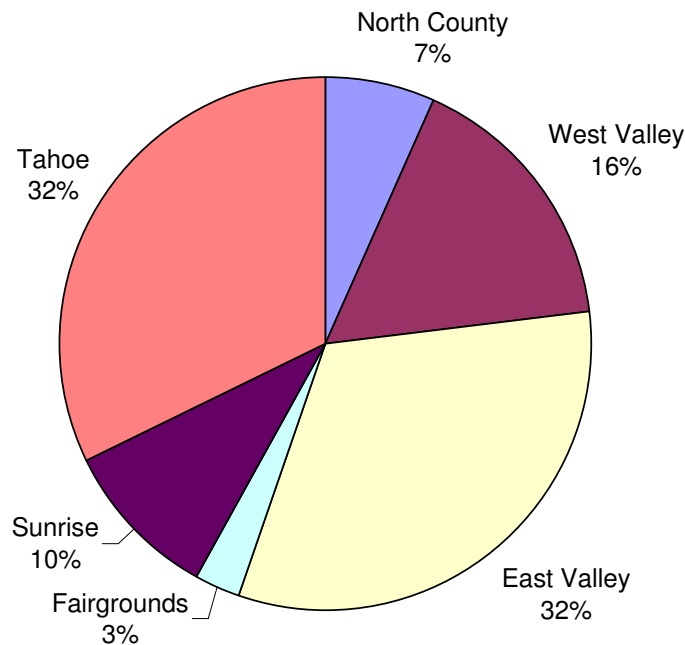
DCU Unaccounted-for Water

Sub-System	Amount (kgal)	% of Sub-system Total	% of DCU Total
North County	1,691	8	5
West Valley	4,007	4	13
East Valley	8,045	2	25
Fairgrounds	701	18	2
Sunrise Estates	2,384	22	30
Tahoe*	8,027	10	25
<b>Total</b>	<b>24,855</b>		

\*Estimated (no meters)

**FIGURE 4.1**

DCU Unaccounted-for Water Percentage Contributions of Each System (2005)



According to Table 4.2 and Figure 4.1, reducing unaccounted-for water in the Sunrise and Tahoe sub-systems could substantially reduce the percentage of unaccounted-for water for the entire DCU system.



4.2.2 Leak Reduction. Leak reduction is an integrated part of the DCU 5 year Capital Improvement Plan (CIP). The utility has identified 44+ leaks and has secured funding for the replacement of the distribution system piping where the leaks are located. Leak reduction will continue play an important role in the DCU CIP.

4.2.3 Use of Treated Effluent. Goal 5.15, Policy 5.15.02 of the Douglas County Master Plan, 2006 Update states the following:

*“Treated effluent will be used to replace supplemental and non-supplemental groundwater pumped for irrigation purposes where feasible.”*

Currently treated effluent is imported to the Carson Valley by Incline Village General Improvement District (IVGID) and Douglas County Sewer Improvement District No. 1. (DCSID No. 1). The effluent is stored in the Valley and used for agricultural irrigation.

Both the Minden-Gardnerville Sanitation District (MGSD) and the Indian Hills General Improvement District (IHGID) store treated effluent which is subsequently used for summertime irrigation purposes.

The County’s North Valley Wastewater Treatment Facility is in the process of constructing a phase 2 storage facility for effluent to be used for irrigation. Once the storage facility is completed the treated effluent will supply irrigation water to Bently Agrowdynamics. Currently the plant is discharging 278,000 to 300,000 gpd into the IVGID wetlands.

Two alternative uses for treated effluent mentioned in the Master Plan include:

1. *“...to supplement existing surface water rights rather than supplemental wells, thereby reducing the pumpage of the groundwater resource.”*
2. *“...to replace the use of existing surface water rights for irrigation and use the surface water rights to recharge the Groundwater Basin.”*

Uses for treated effluent include agricultural irrigation, commercial/industrial landscape irrigation and institutional landscape irrigation including parks and cemeteries.

4.2.4 Drought Measures. These measures are designed to insure a continued water supply in times of drought. Drought measures are more restrictive than those implemented during normal water years. The DCU Drought Plan is found in Section 5.

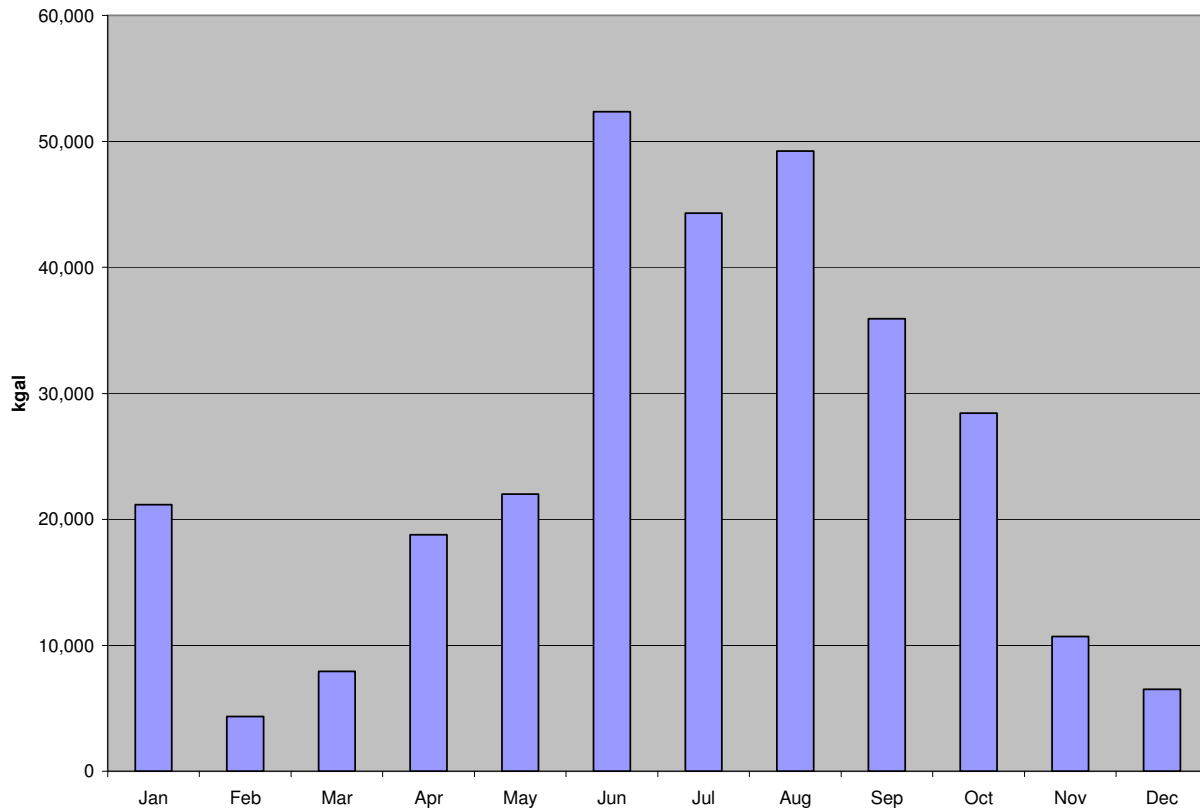
### **4.3 Consumer Conservation Measures**

Residential use in the DCU service area accounts for approximately 70% of all water used. For this reason, the success of conservation planning will be dependant upon the effectiveness of residential conservation measures.

Of all residential water uses, landscaping consumes the greatest amount of water (65% to 75% of summer use) and can be the greatest source of waste. Education programs targeting residential landscapes may be the most efficient way to reduce residential usage. Figure 4.2 shows residential use in the East Valley system in 2005. Note the spike in use during the summer months.

**FIGURE 4.2**

East Valley Residential Use, 2005



**4.3.1 Submetering.** Submeters are meters installed in the main water lines that enter the individual units of multi-family properties (apartments, condominiums, duplexes, etc...) and/or subdivided areas of commercial, industrial, or institutional (ICI) facilities. Traditionally such properties and facilities were built with one master meter that served the entire complex or facility. Submeters can be used as a measure that property or company owners can use to conserve water and cut costs. Submetering has the following basic advantages:

- Decrease in overall water consumption of 18% to 39%<sup>1</sup>
- Fair allocation of water costs to residents.
- Potential increase in property owners net operating income.
- Increase in water use efficiency
- Proper allocation of water costs within ICI operations

<sup>1</sup> *Submetering, RUBS, and Water Conservation*, prepared for the National Apartment Association and the National Multi Housing Council by Industrial Economics Incorporated, June 1999.

In residential applications, submeters can reduce consumption by making the individual users responsible for their own water bill. When water use by multi-family units are measured by a single meter, leaks in individual units often go undetected. Measuring the consumption of each unit may also discourage waste.

In ICI applications separate meters can be used for individual processes thereby encouraging use efficiency. Landscape irrigation can be monitored separately from facility use. In institutions such as universities, water costs can be directed to the departments that use the water. Manufacturers can cut costs and determine which processes or equipment needs to be improved or replaced.

There are some disadvantages to submetering. Retrofits may be expensive and may prove to be economically unfeasible. Also some of the financial incentive for landlords to install conservation devices (low-volume toilets and low-flow fixtures) is removed. These shortcomings however are not present in new construction. Whether new construction or retrofit, consideration should be given to both conservation and cost.

4.3.2 General Consumer Conservation Measures. Currently there are eight mandatory conservation measures that DCU customers are expected to comply with. They are the following:

1. Install and maintain low flow devices on showers and aerators on faucets.
2. Install ultra low flow toilets when replacing existing ones.
3. Use a nozzle that automatically shuts off when washing cars.
4. Plan, plant and manage landscaping to maximize water efficiency.
5. Do not water lawns, landscaping, and gardens between 1:00 p.m. and 5:00 p.m.
6. Do not allow water to pool, pond, or runoff from applied areas.
7. Do not allow water to run down streets due to excessive watering or poorly maintained sprinklers.
8. Equip all fountains, ponds, or pools for recycling water.

Table 4.3 shows the estimated amount of water saved through compliance with each mandatory conservation measure. The table was created by applying the corresponding average percentage of total use for each category in Table 2.7 (page 18) to the target reduction goal of 50 gpcd. Measures 3 through 8 are all landscape/outdoor related activities. The table assumes 1,800 residential connections.

**TABLE 4.3**

Estimated Water Savings for Mandatory Measures (assumes 100% participation)

<b>Mandatory Measure</b>	<b>Savings (gpcd)</b>	<b>Total Annual Savings (MG)</b>
Low flow faucets (#1)	12.48	8.2
Ultra Low Flow Toilets (#2)	7.07	4.6
Landscape/Outdoor (#3 - #8)	18.56	12.2
<b>Totals</b>	<b>38.11</b>	<b>25</b>

Because landscaping makes up 60% to 75% of summer water use, a primary goal of this plan is to encourage smaller turf areas and xeriscapes. Improved landscape practices have the potential to conserve a large amount of water.

Additional consumer residential, landscape, industrial, commercial and institutional measures are included in Appendix B. There are also two plant guides available to consumers, one created especially for Lake Tahoe by the University of Nevada Cooperative Extension Service and the other created by the Truckee Meadow Water Authority (TMWA).

## END OF SECTION

Trigger points and the associated measures have been identified for each stage of drought. When water system operators and managers determine that a trigger point has been reached, they will bring the appropriate information and data to the County Board of Commissioners (Board) for action. The Board will weigh the information and decide what stage of drought should be declared. Once a drought stage has been declared, all measures pertaining to that stage will be implemented and enforced.

Each water system will be monitored autonomously from other systems. When conditions within any system warrant action to anticipate a drought or to endure a drought, the operators and management will inform the Board. The Board shall decide if a drought condition exists in just the service area of the individual water system or will include other systems in the drought finding, as the Board deems appropriate.

In the event of a drought declaration, the following restrictions will be imposed upon all water users of systems owned or operated by Douglas County within the Carson Valley and Topaz Lake area.

### **Stage 1: Drought Warning Stage**

#### Trigger

The Drought Warning Stage is declared when precipitation is below normal. Precipitation is monitored by the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service Station at Glenbrook, Nevada. During the period between the months of October and March, inclusive, when total precipitation for two consecutive months within the period is less than three inches or when total rainfall for the entire period is less than fourteen inches, the water system operators and manager will inform the Board of the condition. The Board will then decide if Drought Warning Stage conditions exist and if so, will make an official declaration. All water customers of systems operated by Douglas County

#### Measures

1. Media announcements will be made informing water users of the drought conditions. Announcements should include the restrictions associated with this stage of drought.
2. All water conservation measures practiced during normal water years (see Appendices B, C, and D).
3. Water service to customers who allow broken sprinklers to operate for two hours will be shut off until the sprinkler is repaired.
4. The County may limit service by use of a flow restriction device, or may shut off service to users that allow leaks on the service side of the water meter to go without repair for a period of longer than five days after receiving written notice of the leak, or after having received three notices for similar violations.

### **Stage 2: Severe Drought Stage**

#### Trigger

The Severe Drought Stage is declared when groundwater levels are below normal, usually, but not necessarily, following a Drought Warning Stage. Well levels of water systems operated by Douglas County within the Carson Valley and Topaz Lake area shall be monitored. When well depths drop below the levels indicated in Table 1, the water system operators and manager will inform the Board of the condition with an opinion as to what drought condition exists or is

anticipated. The Board will then make a determination as to what drought stage (if any) should be declared.

#### Measures

These measures shall be in addition to or supersede those included in the Drought Warning Stage.

1. Residents with even numbered addresses shall water only on Monday, Wednesday, and Saturday.
2. Residents with odd numbered addresses shall water only on Tuesday, Thursday, and Sunday.
3. Commercial and industrial customers shall water only on Tuesday and Friday.
4. Use of water for construction or maintenance activities including dust control, soil compaction and/or concrete curing is prohibited.
5. Use of fire hydrants other than for fire protection is prohibited.
6. Serving of water in restaurants is prohibited except upon request.

### **Stage 3: Emergency Drought Stage**

#### Trigger

The Emergency Drought Stage is declared when groundwater levels are significantly below normal and there are substantial water needs that are not being met. The Emergency Drought Stage usually, but not necessarily, follows a Severe Drought Stage. Well levels of water systems operated by Douglas County within the Carson Valley and Topaz Lake area shall be monitored. When well depths drop below the levels indicated in Table 1, the water system operators and manager will inform the Board of the condition with an opinion as to what drought condition exists or is anticipated. The Board will then make a determination as to what drought stage (if any) should be declared.

There are other situations that make an Emergency Drought Stage declaration necessary. These include emergency repairs or major reconstruction on one of the County maintained systems. If a system requires such a repair and there is no system redundancy to bypass the affected area, the county will ask that an Emergency Drought Stage be declared. Notification of this condition will be made in the media and through door to door notices. All of the mandatory requirements associated with an Emergency Drought Stage will then be enforced for the duration of the repair or reconstruction.

#### Measures

These measures shall be in addition to or supersede those included in the Drought Warning and Severe Drought Stages.

1. During the months of December, January, and February:
  - All watering of vegetation, including lawns, landscaping, and gardens, shall be prohibited.
2. From March 1 through May 31 and from September 1 through November 30:
  - All watering of vegetation, including lawns, landscaping, and gardens, shall be allowed only one day per week.
  - Customers with even numbered addresses shall water only on Wednesday or Saturday.

- Customers with odd numbered addresses shall water only on Thursday or Sunday.
3. Between June 1 and August 31:
- All watering of vegetation, including lawns, landscaping, and gardens, shall be allowed only two days per week.
  - Commercial and industrial customers shall water only on Tuesday and Friday.
  - Residents with even numbered addresses shall water only on Wednesday and Saturday.
  - Residents with odd numbered addresses shall water only on Thursday and Sunday.
4. Water shall not be used for decorative purposes.

**TABLE 1**

Well Levels and Drought Stages

	DEPTH BELOW NORMAL SEASONAL WATER SURFACE (ft)	
	Severe Drought	Emergency Drought
<b>Airport-Mountain View</b>		
North Clapham	-2	-3
South Clapham	-2	-3
Airport 1	-4	-7
<b>Sierra Shadows-Genoa Lakes</b>		
Sierra Shadows 1	-18	-27
Genoa Lakes 1	-18	-27
Genoa Lakes 2	-18	-27
<b>Ridgeview</b>		
Ridgeview 1	-7	-10

END OF SECTION

## **6.1 Effluent**

Presently DCU is pumping treated effluent into wetlands in the Carson Valley. Soon it will have the capability to supply local ranches with effluent to be used for irrigation purposes. To encourage conservation of treated effluent, rates should be established prior to supplying it to consumers. Establishing rates now could also help to offset the cost of new treatment and delivery systems.

Initially rates for treated effluent can be based on the anticipated cost of supplying it to users. However, in many areas the demand for effluent is increasing. Because of this the development of new markets for this commodity would justify potential rate increases that would encourage the conservation of this resource. Potential treated effluent users include:

- Parks and Cemeteries
- Golf Courses
- Landscaping of commercial properties
- Agricultural
- Construction

Rates would obviously be less than those for potable water but would encourage conservation nevertheless. Also current trends indicate that the demand for treated effluent is increasing, making effluent an additional source of revenue. Therefore it is recommended that DCU establish rates for the supply of treated effluent and also work toward creating additional markets for its use.

## **6.2 Water Conservation Budget**

A water conservation budget should be created to allow for the implementation of conservation measures and incentives. The conservation specialist described in Section 5.4 would be responsible for the use of funds allocated for conservation programs and/or personnel. This budget could be used to purchase educational materials, pay for water audits, and increase conservation staff if necessary.

## **6.3 Conservation Specialist/Supervisor**

A member of the DCU staff should be selected to implement and oversee conservation incentives and measures. This person will be responsible for managing a conservation budget, organizing educational programs, overseeing utility conservation efforts (leak detection, public awareness, water loss accountability, etc.), and supervision of any additional conservation personnel. This conservation specialist will review and update the conservation plan at least every five years and will evaluate the effectiveness of existing conservation measures and incentives. This person will also be the head of a conservation committee and will be a source of conservation information and expertise for committee members.

## **6.4 Conservation Committee**

A conservation committee should be created from members of the various departments in DCU. A member of the county commission could also be appointed to the committee. This committee is important because some conservation measures can have a broad affect on the utility as well

as the community. For this reason new measures or incentives should be discussed in a forum of department representatives prior to implementation to be certain all contingencies have been considered. For example rate increases could affect revenues and the conservation specialist could benefit from additional insight provided by the accounting and financial experts within DCU.

### **6.5 Education**

Residential customers use more water than any other customer class. Most of the water used by this class is for landscaping. For this reason water efficient landscaping should be the focus of conservation education efforts. These efforts should include a program for school children to include at least annual visits from DCU personnel. The visits should include presentations on water related issues including landscape conservation. Additionally, workshops with a conservation focus could be held for landscapers and nursery personnel.

### **6.6 Regulatory**

The water ordinance should be modified to include more conservation related provisions. This might include regulations relating to the various stages of drought declaration, landscaping and other mandatory conservation measures. It might also be valuable to include submetering provisions in both the water and landscape ordinance.

### **6.7 Monitoring**

The meter records of the customers that consume the greatest amount of water should be monitored. In many systems approximately 10% of the customers consume 25% of the water. By pinpointing the sources of greatest usage, it may be possible to help customers reduce or eliminate unnecessary consumption. It would be difficult to audit all customers but inspections of the landscape irrigation systems of customers that consume the most might be practical. Also commercial and industrial connections could be audited/inspected to determine if their consumption could be reduced. For all water customers there is financial incentive to cut waste. The meter reading instruction in Appendix F could be helpful in this effort.

### **6.8 Unaccounted-for Water**

For the most part DCU has done a good job of keeping unaccounted-for water to a minimum. DCU currently has a plan to reduce unaccounted-for water in those sub-systems with the greatest amount of losses. A data base of leaks has been kept and areas with the greatest amount of leaks have been targeted for priority replacement.

**END OF SECTION**



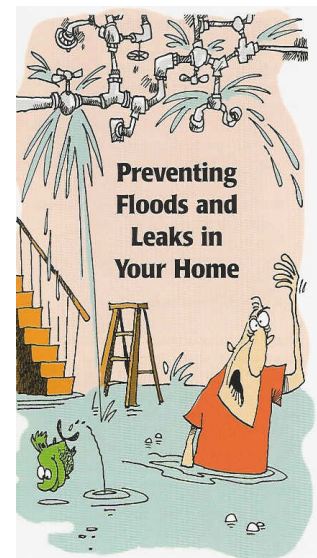
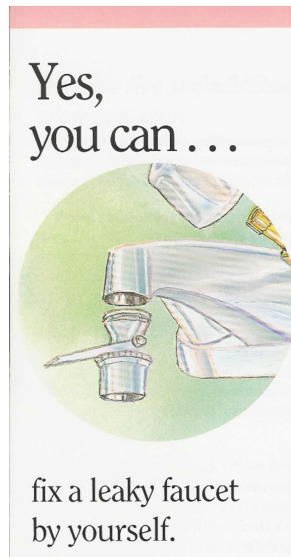
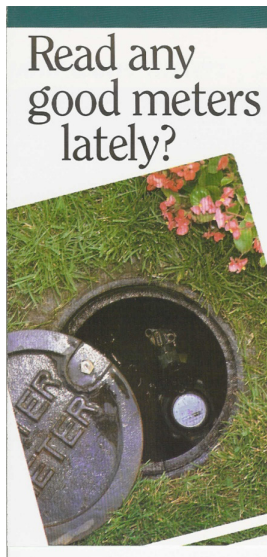
**Read any good meters lately?** Guide provides instruction for reading and interpreting meter information. It also teaches water customers how to measure the amount of water they use in different applications (see figure 3.1).

**Yes, you can...fix a leaky faucet by yourself** pamphlet gives step-by-step instructions on how to fix a leaking faucet. It includes a list of tools necessary to perform the repairs (see figure 3.2).

**FIGURES 3.1, 3.2, and 3.3**

AWWA Conservation Pamphlets

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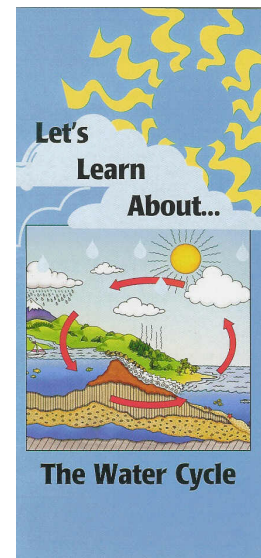
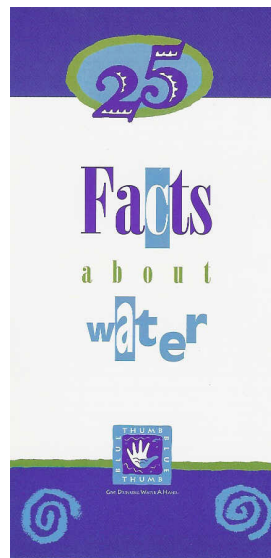
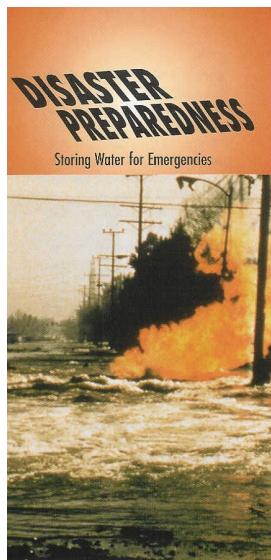


**Preventing Floods and Leaks in Your Home** emphasizes the importance of locating a master valve and discusses where it might be. It also deals with faucet, toilet, and hose leaks (see figure 3.3).

**Disaster Preparedness, Storing Water for Emergencies** addresses four important emergency questions; How much water should be stored, How long can tap water be stored safely, What is a boil water order, and How will I know when the water is safe again (see figure 3.4).

**FIGURES 3.4, 3.5 and 3.6**

AWWA Conservation Pamphlets

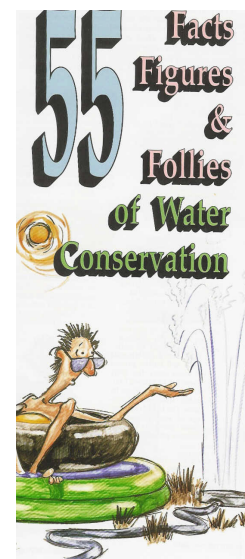
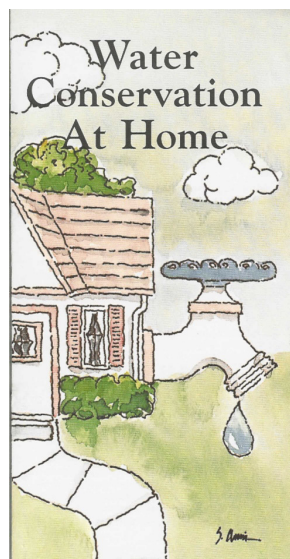
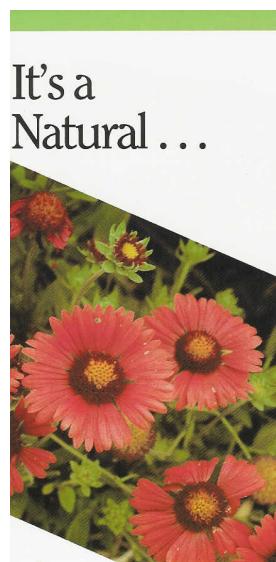


**25 Facts About Water** is a list of 25 water facts that encourage conservation (see figure 3.5).

**Lets Learn About the Water Cycle** diagrams the seven stages of the water cycle (see figure 3.6).

**FIGURES 3.7, 3.8, and 3.9**

AWWA Conservation Pamphlets



**Its a Natural** makes suggestions regarding landscape including planning, design, soils, and irrigation (see figure 3.7).

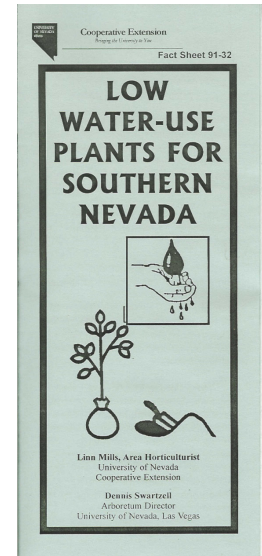
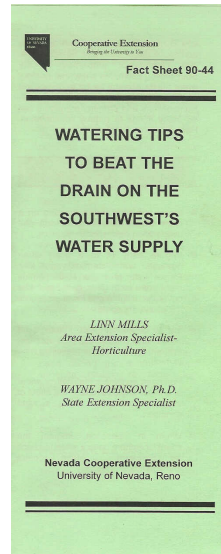
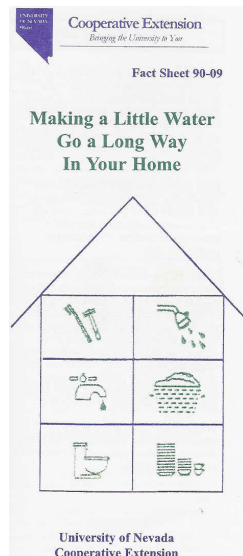
**Water Conservation at Home** discusses in-home conservation practices for bathroom, kitchen, and outdoor water use (see figure 3.8).

**55 Facts Figures & Follies of Water Conservation** is similar to “25 Facts about Water” but it provides a bit more information (see figure 3.9).

In addition to the above mentioned AWWA publications, The University of Nevada Cooperative Extension publishes Fact Sheets that encourage conservation. Fact Sheet 90-09 “Making a Little Water Go a Long Way in Your Home” contains residential conservation tips (see figure 3.10), Fact Sheet 90-40 “Watering Tips to Beat the Drain on the Southwest’s Water Supply” provides tips to make landscapes more water efficient (see figure 3.11) and Fact Sheet 91-32 is a list of low water-use plants for southern Nevada (see figure 3.12).

### **FIGURES 3.10, 3.11, and 3.12**

#### **University of Nevada Cooperative Extension Fact Sheets**



## APPENDIX B – CONSERVATION MEASURES

Conservation measures are divided into two types: (1) Hardware/Equipment and (2) Behavioral/Managerial. Each of these is subdivided into five categories of application: (1) Residential, (2) Landscape, (3) Industrial, Commercial, and Institutional (ICI) (4) Agricultural, and (5) Purveyor. The following conservation measures will be classified first by application and then by type.

### B.1 RESIDENTIAL CONSERVATION MEASURES

#### B.1.1 Behavioral Measures

B.1.1.1 Residential Water Audits. Water audits could target high use customers first and then be offered to all customers. The following elements should be part of an effective audit.

- Purpose for the audit.
- Estimation of use for all fixtures and appliances.
- Check for and repair leaks.
- Evaluation of Landscape (See "Landscape Conservation Measures)
- Evaluation of outdoor water use.
- Evaluate efficiency measures.
- Educate customers using available flyers

An audit should take no more than 30 to 45 minutes.

B.1.1.2 Additional Measures. The sample pamphlets in Appendix A include additional behavioral conservation measures.

#### B.1.2 Hardware/Equipment Measures

The following is a list of devices/practices that will reduce water consumption in the home.

Measure	Description
<b><i>Bathroom/Kitchen Fixtures</i></b>	
Low-flow toilets	1.6 gallons per flush
Toilet retrofit devices	Bladders (bags), dams, early close flappers, other hardware and adjustments
Toilet leak repairs	Includes detection (dye tabs) and replacement of worn parts.
Low-volume shower heads	2.5 gallons per minute @ 80 psi
Showerhead retrofit devices	Includes temporary cutoff valves and restrictors.
Low-volume faucets	2.5 gallons per minute @ 80 psi
Faucet retrofit devices	Includes aerators, activation sensors, self closing and metered valves
Faucet maintenance	Includes washer replacement, repacking, tightening, and cleaning aerators
Water pressure reduction	Only needed if house pressure exceeds what's required
<b><i>High Efficiency Appliances</i></b>	
Clothes washers	27 gallons per load
Dish washers	4.5 gallons per load

## B.2 LANDSCAPE CONSERVATION MEASURES

### B.2.1 Behavioral Measures

B.2.1.1 Landscape Water Audits. Landscape water audits should be conducted on park and golf course irrigation systems and could be considered an option on residential irrigation systems, targeting high-volume users.

- Purpose for the audit.
- Estimation of outdoor use based on meter records.
- Check for and repair leaks.
- Evaluation of Landscape (size, soil, amount of turf, types of plants)
- Evaluation of irrigation system (Timers, Use of drip, Precipitation amounts).
- Efficiency recommendations.
- Educate customers using available flyers

A residential landscape audit should take no more than an hour. Parks and golf courses could take substantially longer.

B.2.1.2 Xeriscape™. Xeriscape is a method of landscaping that employs low-water use plants, turf, ground covers, shrubs and trees. It includes careful planning, soil analysis, and irrigation system design.

B.2.1.3 Additional Measures. The sample pamphlets in Appendix A include additional behavioral conservation measures.

### B.2.2 Hardware/Equipment Measures

Landscape hardware measures consist of two basic groups: (1) Landscape materials and (2) irrigation equipment.

Measure	Description
<b><i>Landscape Materials</i></b>	
Trees, plants, and grass	Should be well suited to climate and altitude and be drought tolerant
Organic mulch	Grass clippings, leaves, wood chips, bark, and pine needles. Organic mulches help to retain soil moisture and keep ground cool around plants.
Inorganic mulch	Boulders, gravel, pavers, decomposed granite, and stepping stones. Inorganic mulches are generally more for decorative purposes but they reduce the amount of trees, plants, and turf thereby conserving water.
Compost	Made of manure or biosolids and wood, straw, grass, and leaves. Helps plants stay healthy and retains moisture in the soil.
<b><i>Irrigation Equipment</i></b>	
Valves	Should be sized to meet requirements and checked periodically for leaks
Sprinkler Heads	Should match water volume requirements of area being irrigated.
Sprinkler Nozzles	Should have proper arc of coverage and proper trajectory.
Irrigation Controllers	Should have required number of stations, programs, and starts. Also rain delays and sensor terminals.
Drip irrigation	Insures water is directed to where it's needed.

## B.3 INDUSTRIAL, COMMERCIAL, AND INSTITUTIONAL (ICI) CONSERVATION MEASURES

### B.3.1 Behavioral and Hardware/Equipment Measures

B.3.1.1 ICI Water Audits. Since ICI water audits can require a substantial amount of time (4 hours or more), it may be necessary to have a private engineering firm hired by the water user conduct the audit. There is incentive for ICI customers to pay for audits since the results of an audit could translate into substantial savings. An ICI water audit should include the following elements:

- Support from ICI owners, managers, and employees
- Survey/Estimation of facility use based on meter records.
- Calculation of water-related costs.
- Evaluation of efficiency measures.
- Evaluation of payback periods for measures.
- Efficiency recommendations and implementation.
- Tracking and reporting system.

B.3.1.2 Manual Washing. Manual washing is cleaning done on surfaces with hoses and cloths.

MANUAL WASHING	
Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"><li>• Surfaces should be swept or brushed off before using water to clean.</li></ul>	<ul style="list-style-type: none"><li>• High pressure low-volume hoses with automatic shut-off nozzles</li><li>• High-pressure pumps, steam cleaners.</li></ul>

B.3.1.3 Vehicle Washing. Vehicle washing includes manual washing and automated car washes or a combination of both.

VEHICLE WASHING	
Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"><li>• Limit number of spray nozzles and set flow rates at lowest volume and pressure required.</li><li>• Adjust nozzles in automated systems so that they take full advantage of gravity and position. Also make sure water shuts off after vehicles have passed.</li><li>• Increase conveyor speeds or reduce rinse cycle time.</li><li>• Sweep wash area before using water to clean.</li><li>• Establish a regular maintenance schedule that includes checking for leaks and making repairs.</li></ul>	<ul style="list-style-type: none"><li>• Recycling systems. These would include filters and storage tanks.</li><li>• High pressure pumping systems.</li></ul>

B.3.1.4 Kitchens and Restaurants. Kitchen and restaurant conservation is divided into four areas of application; 1. Food and drink preparation, 2. Dishwashing, 3. Garbage disposal and scraping trough, and 4. Ice making.

## FOOD AND DRINK PREPARATION

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Presoak and wash food service articles in basins instead of running water.</li> <li>• Reduce thawing of food with hot water unless required by law. If required use lower flow.</li> <li>• Avoid running water to melt ice in sinks.</li> <li>• Use full loads in dishwashers and other automated equipment.</li> <li>• Serve water only when requested by customers.</li> </ul>	<ul style="list-style-type: none"> <li>• Low-volume faucets</li> <li>• Hands-free foot pedal valves for faucets</li> <li>• On demand hot water dispensers</li> </ul>

## DISHWASHING

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Presoak utensils, dishes, and pots and pans in basins of water instead of using running water prior to loading dishwashing machines.</li> <li>• Scrape food off of plates rather than use running water.</li> <li>• Operate scraping troughs only while dishes are actually being washed.</li> <li>• Assess the water efficiency of the current dishwashing system to determine where improvements might be made.</li> <li>• Always wash full loads in automated machines.</li> <li>• Operate conveyor type dishwashers only when dishes are actually passing through the machine.</li> <li>• Verify that the dishwashing equipment is using the minimum amount of flow recommended by the manufacturer.</li> <li>• Since many older automated dishwashing systems are neither energy nor water efficient, evaluate the cost of retrofitting or replacing existing equipment.</li> <li>• Turn dishwashers off when not in use.</li> <li>• Routinely check all dishwashing equipment to ensure there are no leaks.</li> <li>• Post signs requesting that personnel minimize their use of utensils, dishes, and pots and pans to save water.</li> </ul>	<ul style="list-style-type: none"> <li>• Manual pre-wash sprayers with “dead man” shut off controls.</li> <li>• Low-flow spray heads on all sprayers.</li> <li>• New water efficient dishwashing equipment.</li> <li>• Electronic eye sensors that shut off conveyer type systems when dishes are not passing through the machine.</li> </ul>

### GARBAGE DISPOSER AND SCRAPING TROUGH

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Eliminate disposers and troughs.</li> <li>• Use the minimum acceptable flow rate on all machines.</li> <li>• Reuse wastewater in the mixing chamber of the disposer.</li> </ul>	<ul style="list-style-type: none"> <li>• Garbage strainers (instead of disposers)</li> <li>• Sensors that detect the amount of flow in a disposer and regulate flow accordingly.</li> <li>• Solenoid valves that turn water off when the disposer is off.</li> <li>• Flow regulators for disposer supply lines.</li> </ul>

### ICE MAKERS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Use the minimum flow rate recommended by the manufacturer on water cooled icemakers.</li> <li>• Adjust machines to produce ice only when it's needed.</li> </ul> <p>Collect spent cooling water and reuse it for non-potable purposes.</p>	<ul style="list-style-type: none"> <li>• Air-cooled icemakers.</li> <li>• Re-circulating systems for water-cooled icemakers.</li> <li>• Ice flake machines that use less bleed off than cube machines.</li> </ul>

B.3.1.5 Laundries and Laundromats. This section includes measures that are applicable in hotels, motels, hospitals, nursing homes, diaper services, restaurants, and coin operated Laundromats.

### LAUNDRIES AND LAUNDROMATS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Operate equipment with full loads only.</li> <li>• Reduce water levels for partial loads.</li> <li>• Back flush filters or softeners only when necessary.</li> </ul>	<ul style="list-style-type: none"> <li>• Computer controlled rinse water reclamation systems.</li> <li>• Wash and rinse water treatment and reclamation systems.</li> <li>• Continuous batch washers.</li> <li>• Ozone laundry systems.</li> <li>• Horizontal axis washers.</li> </ul>

B.3.1.6 Swimming Pools. The measures in this section can be applied to commercial and residential swimming pools.

### SWIMMING POOLS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Limit the frequency of pool refilling.</li> <li>• Cover the pool with an insulated cover when not in use to reduce losses due to heat and evaporation.</li> <li>• Reduce the level of the pool to avoid losses due to splashing.</li> <li>• Lower the pool temperature.</li> <li>• Back wash filters only when necessary. If backwash is timed, verify that frequency is efficient.</li> <li>• Regularly check pool for leaks and cracks. Keep pool and filter clean to avoid unnecessary backwashing.</li> </ul>	<p>There are no special equipment measures that would help conserve water in pools. It is important however that available equipment is efficient and used properly.</p>



**B.3.1.7 Cooling Systems.** This section includes measures for three types of cooling systems: 1. Single-pass, 2. Evaporative, and 3. Equipment. Single-pass cooling uses fresh water to cool without re-circulating any of the water used in the first pass. Evaporative coolers are used for cooling in commercial and residential applications and are commonly known as swamp coolers. Equipment cooling includes both single-pass and re-circulating systems that are used to cool equipment and machinery.

#### **SINGLE-PASS COOLING**

<b>Behavioral Measures</b>	<b>Hardware/Equipment Measures</b>
<ul style="list-style-type: none"> <li>Reuse water for landscaping, vehicle washing, or another cooling application that allows for water to be at a higher temperature.</li> <li>Eliminate single-pass systems.</li> </ul>	<ul style="list-style-type: none"> <li>Air-cooled equipment (i.e. compressors, pumps, icemakers, etc...)</li> <li>Automatic controls that insure coolers only operate when needed.</li> </ul>

#### **EVAPORATIVE COOLING**

<b>Behavioral Measures</b>	<b>Hardware/Equipment Measures</b>
<ul style="list-style-type: none"> <li>Regularly check for leaks in hoses and pan.</li> <li>Replace pads at least annually.</li> <li>Shut cooler off when building is unoccupied.</li> <li>Annually service the equipment by oiling moving parts and cleaning off accumulated scale or corrosion.</li> </ul>	<p>There are currently no equipment measures for evaporative coolers. The design of the coolers is relatively simple.</p>

#### **EQUIPMENT COOLING**

<b>Behavioral Measures</b>	<b>Hardware/Equipment Measures</b>
<ul style="list-style-type: none"> <li>Reuse water in single pass systems for other cooling purposes. Examples of reuse include cooling molten materials, landscape, of boiler make-up water.</li> <li>Replace al single pass cooling systems with closed-loop systems or replace water-cooled equipment with air-cooled.</li> </ul>	

**B.3.1.8 Heating Systems.** This section deals with conservation measures for boilers and steam generators which are used to heat large buildings and multiple-building facilities.

## HEATING SYSTEMS

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Regularly inspect systems for leaks and make repairs.</li> <li>• Insulate all piping.</li> <li>• Limit boiler bleed-off to a level that satisfies water quality requirements.</li> <li>• Discharge blow-down into an expansion tank instead of using cold water to cool it.</li> </ul>	<ul style="list-style-type: none"> <li>• Flow meters for make-up and blow-down valves.</li> <li>• Automatic controls to discharge blow-down.</li> </ul>

B.3.1.9 Leaks and Water Losses. This section covers water conservation measures relating to leaks and losses.

## LEAKS AND WATER LOSSES

Behavioral Measures	Hardware/Equipment Measures
<ul style="list-style-type: none"> <li>• Regularly check for leaks at all water connections. Keep in mind that higher pressure applications have more incidence of leakage.</li> <li>• Regularly check all vessels that contain water for cracks or bad seals.</li> <li>• Regularly check all heating and cooling systems.</li> <li>• Repair any leaks that are discovered.</li> </ul>	<ul style="list-style-type: none"> <li>• Leak detection equipment. This could include sonic or probe type equipment.</li> <li>• Any equipment used to stop a leak. This would depend on the material of the pipe or vessel that has a leak.</li> </ul>

B.3.1.10 ICI Maintenance Practices. This section reemphasizes maintenance conservation measures for ICI facilities that have been mentioned in previous sections. These measures should become standard procedure at all ICI facilities.

- Create a maintenance schedule that includes schedules for leak detection inspections and meter reading, and repair procedures.
- Monitor water-use records keeping track of any increases or decreases in use.
- Conduct water audits every one to three years.
- Shut off supply lines to areas that are not being used.
- Install pressure reducers where feasible.
- Keep a maintenance schedule to clean cooling and heating equipment regularly.
- Recycle and reuse water when feasible.
- Insulate all hot water pipes.
- Replace old equipment with water saving equipment.
- Install timers wherever possible.
- Educate employees on water saving techniques.

## B.4 GENERAL CONSERVATION MEASURES

This list of conservation behaviors and is divided into four parts: Home, Landscaping, Community, and Miscellaneous.

### HOME BEHAVIORS

1. When washing dishes by hand, don't let the water run while rinsing. Fill one sink with wash water and the other with rinse water.

2. Evaporative coolers require a seasonal maintenance checkup. For more efficient cooling, check your evaporative cooler annually.
3. Run your washing machine and dishwasher only when they are full and you could save 1000 gallons a month.
4. Use the garbage disposal sparingly. Compost instead and save gallons every time.
5. Keep a pitcher of water in the refrigerator instead of running the tap for cold drinks, so that every drop goes down you not the drain.
6. Check your water meter and bill to track your water usage.
7. Wash your produce in the sink or a pan that is partially filled with water instead of running water from the tap.
8. Use a broom instead of a hose to clean your driveway or sidewalk and save 80 gallons of water every time.
9. If your shower can fill a one-gallon bucket in less than 20 seconds, then replace it with a water efficient showerhead.
10. Collect the water you use for rinsing produce and reuse it to water houseplants.
11. We're more likely to notice leaky faucets indoors, but don't forget to check outdoor faucets, pipes, and hoses for leaks.
12. When you shop for a new appliance, consider one offering cycle and load size adjustments. They are more water and energy-efficient than older appliances.
13. Time your shower to keep it under 5 minutes. You'll save up to 1000 gallons a month.
14. Install low-volume toilets.
15. When you clean your fish tank, use the water you've drained on your plants. The water is rich in nitrogen and phosphorus, providing you with a free and effective fertilizer.
16. Put food coloring in your toilet tank. If it seeps into the toilet bowl, you have a leak. It's easy to fix, and you can save more than 600 gallons a month.
17. Plug the bathtub before turning the water on, and then adjust the temperature as the tub fills up.
18. Designate one glass for your drinking water each day. This will cut down on the number of times you run your dishwasher.
19. Don't use running water to thaw food.
20. Grab a wrench and fix that leaky faucet. It's simple, inexpensive, and can save 140 gallons a week.
21. When doing laundry, match the water level to the size of the load.
22. Teach your children to turn the faucets off tightly after each use.
23. Before you lather up, install a low-flow showerhead. They're inexpensive, easy to install, and can save your family more than 500 gallons a week.
24. Soak your pots and pans instead of letting the water run while you scrape them clean.

25. Make sure you know where your master water shut-off valve is located. This could save gallons of water and damage to your home if a pipe were to burst.
26. Turn off the water while you brush your teeth and save 4 gallons a minute. That's 200 gallons a week for a family of four.
27. Make sure your toilet flapper doesn't stick open after flushing.
28. Make sure there are aerators on all of your faucets.
29. Install an instant water heater on your kitchen sink so you don't have to let the water run while it heats up. This will also reduce heating costs for your household.
30. Cut back on rinsing if your dishwasher is new. Newer models clean more thoroughly than older ones.
31. Bathe your young children together.
32. Winterize outdoor spigots when temps dip to 20 degrees F to prevent pipes from bursting or freezing.
33. Insulate hot water pipes so you don't have to run as much water to get hot water to the faucet.
34. Drop that tissue in the trash instead of flushing it and save gallons every time.
35. If your toilet was installed prior to 1980, place a toilet dam or bottle filled with water in your toilet tank to cut down on the amount of water used for each flush. Be sure these devices do not interfere with operating parts.
36. Install water softening systems only when necessary. Save water and salt by running the minimum number of regenerations necessary to maintain water softness.
37. Wash clothes only when you have a full load and save up to 600 gallons each month.
38. Listen for dripping faucets and toilets that flush themselves. Fixing a leak can save 500 gallons each month.
39. Cook food in as little water as possible. This will also retain more of the nutrients.
40. Turn the water off while you shampoo and condition your hair and you can save more than 50 gallons a week.
41. Choose new water-saving appliances, like washing machines that save up to 20 gallons per load.
42. Select the proper size pans for cooking. Large pans require more cooking water than may be necessary.
43. Turn off the water while you shave and you can save more than 100 gallons a week.
44. To save water and time, consider washing your face or brushing your teeth while in the shower.
45. For hanging baskets, planters and pots, place ice cubes under the moss or dirt to give your plants a cool drink of water and help eliminate water overflow.
46. Throw trimmings and peelings from fruits and vegetables into your yard compost to prevent from using the garbage disposal.
47. Keep a bucket in the shower to catch water as it warms up or runs. Use this water to flush toilets or water plants.

48. When you are washing your hands, don't let the water run while you lather.
49. Pre-treat stains before washing clothes to avoid re-washing.
50. Use the shortest wash cycle for lightly soil cloths.
51. Check washing machine hoses regularly for leaks.
52. Do not pre-rinse dishes except in cases of sticky or burn-on food.
53. Scrape off food with a utensil or used paper napkin when pre-cleaning for dishwasher.

## **LANDSCAPE BEHAVIORS**

1. Check your sprinkler system frequently and adjust sprinklers so only your lawn is watered and not the house, sidewalk, or street.
2. Avoid planting turf in areas that are hard to water such as steep inclines and isolated strips along sidewalks and driveways.
3. Plant during the spring or fall when the watering requirements are lower.
4. Minimize evaporation by watering during the early morning hours, when temperatures are cooler and winds are lighter.
5. Use a layer of organic mulch around plants to reduce evaporation and save hundreds of gallons of water a year.
6. Divide your watering cycle into shorter periods to reduce runoff and allow for better absorption every time you water.
7. Only water your lawn when needed. You can tell this by simply walking across your lawn. If you leave footprints, it's time to water.
8. Adjust your lawn mower to a higher setting. Longer grass shades root systems and holds soil moisture better than a closely clipped lawn.
9. Use the sprinkler for larger areas of grass. Water small patches by hand to avoid waste.
10. Use porous materials for walkways and patios to keep water in your yard and prevent wasteful runoff.
11. Direct downspouts and other runoff towards shrubs and trees, or collect and use for your garden.
12. Install a rain shut-off device on your automatic sprinklers to eliminate unnecessary watering.
13. Choose a water-efficient drip irrigation system for trees, shrubs and flowers. Watering at the roots is very effective, be careful not to over water.
14. Reduce the amount of grass in your yard by planting shrubs and ground cover with rock and granite mulching.
15. Remember to check your sprinkler system valves periodically for leaks and keep the heads in good shape.
16. Don't water your lawn on windy days. After all, sidewalks and driveways don't need water.
17. Water your plants deeply but less frequently to create healthier and stronger landscapes.

18. When watering grass on steep slopes, use a soaker hose to prevent wasteful runoff.
19. Group plants with the same watering needs together to get the most out of your watering time.
20. Remember to weed your lawn and garden regularly. Weeds compete with other plants for nutrients, light, and water.
21. While fertilizers promote plant growth, they also increase water consumption. Apply the minimum amount of fertilizer needed.
22. Avoid installing ornamental water features and fountains that spray water into the air. Trickling or cascading fountains lose less water to evaporation.
23. Buy a rain gauge to track how much rain or irrigation your yard receives. Check with your local water agency to see how much rain is needed to skip an irrigation cycle.
24. Teach your family how to shut off your automatic watering systems. Turn sprinklers off if the system is malfunctioning or when a storm is approaching.
25. Set a kitchen timer when watering your lawn or garden with a hose.
26. Next time you add or replace a flower or shrub, choose a low water use plant for year-round landscape color and save up to 550 gallons each year.
27. Use a screwdriver as a soil probe to test soil moisture. If it goes in easily, don't water. Proper lawn watering can save thousands of gallons of water annually.
28. Avoid over-seeding your lawn with winter grass. Once established, ryegrass needs water every three to five days, whereas dormant Bermuda grass needs water only once a month.
29. Landscape with Xeriscape trees, plants and groundcovers. Call your local conservation office for more information about these water thrifty plants.
30. If you have an evaporative cooler, direct the water drain to a flowerbed, tree, or your lawn.
31. Leave lower branches on trees and shrubs and allow leaf litter to accumulate on top of the soil. This keeps the soil cooler and reduces evaporation.
32. Start a compost pile. Using compost when you plant adds water-holding organic matter to the soil.
33. Use sprinklers that throw big drops of water close to the ground. Smaller drops of water and mist often evaporate before they hit the ground.
34. More plants die from over-watering than from under-watering. Be sure only to water plants when necessary.
35. Water only as rapidly as the soil can absorb the water.
36. Aerate your lawn. Punch holes in your lawn about six inches apart so water will reach the roots rather than run off the surface.

## **COMMUNITY BEHAVIORS**

1. Encourage your school system and local government to help develop and promote a water conservation ethic among children and adults.
2. Make suggestions to your employer to save water (and dollars) at work.

3. Support projects that use reclaimed wastewater for irrigation and other uses.
4. Encourage your friends and neighbors to be part of a water-conscious community.
5. Pick-up the phone and report significant water losses from broken pipes, open hydrants and errant sprinklers to the property owner or your water management district.

#### **MISCELLANEOUS BEHAVIORS**

1. Install covers on pools and spas and check for leaks around your pumps.
2. Periodically check your pool for leaks if you have an automatic refilling device.
3. Use a commercial car wash that recycles water.
4. Don't buy recreational water toys that require a constant flow of water.
5. Use a grease pencil to mark the water level of your pool at the skimmer. Check the mark 24 hours later. Your pool should lose no more than ¼ inch each day.
6. When the kids want to cool off, use the sprinkler in an area where your lawn needs it the most.
7. Make sure your swimming pools, fountains, and ponds are equipped with re-circulating pumps.
8. Bathe your pets outdoors in an area in need of water.
9. While staying in a hotel or even at home, consider reusing your towels.
10. When backwashing your pool, consider using the water on your landscaping.

**WATER**

- [www.amsa-cleanwater.org](http://www.amsa-cleanwater.org)
- [www.energystar.gov](http://www.energystar.gov)

**DROUGHT**

- [DroughtMonitor@ndmc.unl.edu](mailto:DroughtMonitor@ndmc.unl.edu)

**LANDSCAPE**

- [www.usda.gov/news/garden.htm](http://www.usda.gov/news/garden.htm)
- [www.tmwlandscapeguide.com/landscape\\_guide/interactive/index.php](http://www.tmwlandscapeguide.com/landscape_guide/interactive/index.php)

**EDUCATION**

- [www.wateruseitwisely.com](http://www.wateruseitwisely.com)
- [www.washoeet.dri.edu/](http://www.washoeet.dri.edu/)

**INSTITUTIONAL**

- [www.douglascountynv.gov/sites/main/index.cfm](http://www.douglascountynv.gov/sites/main/index.cfm)
- [www.lvwd.com](http://www.lvwd.com)
- [www.snwa.com](http://www.snwa.com)
- [www.co.washoe.nv.us/water\\_dept/rwpc/regionalplm](http://www.co.washoe.nv.us/water_dept/rwpc/regionalplm)
- [www.tmh20.com](http://www.tmh20.com)
- [www.cabq.gov](http://www.cabq.gov)
- [www.ci.phoenix.az.us/WATER/wtrteach.html](http://www.ci.phoenix.az.us/WATER/wtrteach.html)
- [www.owue.water.ca.gov/leak/faq/faq.cfm](http://www.owue.water.ca.gov/leak/faq/faq.cfm)

**LEAK DETECTION**

- [www.who.int/docstore/water\\_sanitation\\_health/leakage/begin.html](http://www.who.int/docstore/water_sanitation_health/leakage/begin.html)





The following list is taken from the Truckee Meadows Water Authority (TMWA) website. More information on these plants, including color photos can be found at [www.tmwlandscapeguide.com](http://www.tmwlandscapeguide.com).

## PERENNIAL FLOWERS

[Artemisia species](#)/Sage or Wormwood (Perennial)—water use: Very Low

[Eriogonum umbellatum](#)/Sulfur Flowered Buckwheat (Perennial)—water use: Very Low

[Achillea species](#)/Yarrow (Perennial)—water use:Low

[Agastache cana](#)/Bubblemint (Perennial)—water use:Low

[Aurinia saxatilis](#)/Basket-of-Gold (Perennial)—water use:Low

[Coreopsis species](#)/Tickseed (Perennial)—water use:Low

[Crocus species](#)/Spring Crocus (Perennial)—water use:Low

[Dianthus species](#)/Pinks (Perennial)—water use:Low

[Eschscholzia californica](#)/California poppy (Perennial)—water use:Low

[Gaillardia grandiflora](#)/Blanket Flower (Perennial)—water use:Low

[Iris germanica](#)/Iris germanica (Perennial)—water use:Low

[Linum species](#)/Flax (Perennial)—water use:Low

[Narcissus species](#)/Daffodil or Narcissus (Perennial)—water use:Low

[Nepeta racemosa](#)/Catmint (Perennial)—water use:Low

[Oenothera species](#)/Evening Primrose (Perennial)—water use:Low

[Perovskia atriplicifolia](#)/Russian Sage (Perennial)—water use:Low

[Sedum species](#)/Stonecrop (Perennial)—water use:Low

[Senecio Cineraria](#)/Dusty Miller (Perennial)—water use:Low

[Stachys byzantina](#)/Lamb's Ears (Perennial)—water use:Low

[Thermopsis montana](#)/No Lupine (Perennial)—water use:Low

[Tulbaghia violacea](#)/Society Garlic (Perennial)—water use:Low

[Alcea rosea](#)/Hollyhock (Perennial)—water use:Moderate

[Antirrhinum majus](#)/Snapdragon (Perennial)—water use:Moderate

[Armeria maritima](#)/Sea Pinks (Perennial)—water use:Moderate

[Aster species](#)/Aster (Perennial)—water use:Moderate

[Echinacea purpurea](#)/Coneflower (Perennial)—water use:Moderate

[Gaura lindheimeri](#)/Gaura (Perennial)—water use:Moderate

[Geranium species](#)/Handy Geranium (Perennial)—water use:Moderate

[Gypsophila species](#)/Baby's Breath (Perennial)—water use:Moderate

[Hemerocallis hybrids](#)/Daylily (Perennial)—water use:Moderate

[Heuchera sanguinea](#)/Coral Bells (Perennial)—water use:Moderate

[Iberis sempervirens](#)/Candytuft (Perennial)—water use:Moderate

[Kniphofia uvaria](#)/Red Hot Poker (Perennial)—water use:Moderate

[Lavandula angustifolia](#)/Lavender (Perennial)—water use:Moderate

[Lilium species](#)/Lily (Perennial)—water use:Moderate

[N/A](#)/Pussy toes (Perennial)—water use:moderate

[Papaver species](#)/Poppy (Perennial)—water use:Moderate

[Penstemon species](#)/Beard Tongue (Perennial)—water use:Moderate

[Platycodon grandiflorus](#)/Balloon Flower (Perennial)—water use:Moderate

[Rudbeckia fulgida](#)/Black-Eyed Susan (Perennial)—water use:Moderate

[Salvia Species](#)/Sage or Salvia (Perennial)—water use:Moderate

[Saponaria species](#)/Soapwort (Perennial)—water use:Moderate

[Tanacetum species](#)/Painted or Michaelmas Daisy (Perennial)—water use:Moderate

[Tulipa species](#)/Tulip (Perennial)—water use:Moderate

[Veronica spicata](#)/Spike Speedwell (Perennial)—water use:Moderate

[Viola species](#)/Violet or Pansy (Perennial)—water use:Moderate

## **GROUNDCOVERS, VINES, AND GRASSES**

[Opuntia polyacantha](#)/Prickly Pear Cactus (Groundcovers)—water use:Very Low

[Clematis species](#)/Clematis (Groundcovers)—water use:Low

[Euphorbia species](#)/Spurge (Groundcovers)—water use:Low

[Helictorichon sempervirens](#)/Blue Oat Grass (Groundcovers)—water use:Low

[Hypericum calycinum](#)/Jacob's Ladder or Aaron's Beard (Groundcovers)—water use:Low

[Juniperus horizontalis](#)/Groundcover Junipers (Groundcovers)—water use:Low

[Lathyrus latifolius](#)/Perennial Sweet Pea (Groundcovers)—water use:Low

[Lonicera species](#)/Honeysuckle (Groundcovers)—water use:Low

[Panicum virgatum](#)/Switch Grass (Groundcovers)—water use:Low

[Polygonum species](#)/Polygonum (Groundcovers)—water use:Low

[Santolina species](#)/Lavender Cotton (Groundcovers)—water use:Low

[Vinca minor](#)/Dwarf Periwinkle (Groundcovers)—water use:Low

[Wisteria sinensis](#)/Chinese Wisteria (Groundcovers)—water use:Low

[Zauschneria californica](#)/California Fuschia (Groundcovers)—water use:Low

[Calmagrostis x acutiflora](#)/Feather Reed Grass (Groundcovers)—water use:Moderate

[Campsis radicans](#)/Red Trumpet Creeper (Groundcovers)—water use:Moderate

[Cerastium tomentosum](#)/Snow in Summer (Groundcovers)—water use:Moderate

[Delosperma cooperi](#)/Hardy Purple Ice Plant (Groundcovers)—water use:Moderate

[Hedera helix](#)/Ivy (Groundcovers)—water use:Moderate

[Helianthemum nummularium](#)/Sunrose (Groundcovers)—water use:Moderate

[Mahonia repens](#)/Creeping Mahonia (Groundcovers)—water use:Moderate

[N/A](#)/Northern seacats (Groundcovers)—water use:moderate

[Phlox subulata](#)/Moss Pink (Groundcovers)—water use:Moderate

[Potentilla neumanniana](#)/Cinquefoil (Groundcovers)—water use:Moderate

[Sedum species](#)/Stonecrop (Groundcovers)—water use:Moderate

[Thymus species](#)/Thyme (Groundcovers)—water use:Moderate

## SHRUBS

[Artemisia tridentata var. tridentata](#)/Big Sagebrush (Shrubs)—water use:Very Low

[Atriplex canescens](#)/Four Wing Saltbrush (Shrubs)—water use:Very Low

[Chrysothamnus nauseosus](#)/Rubber Rabbitbrush (Shrubs)—water use:Very Low

[Amelanchier species](#)/Serviceberry or Juneberry (Shrubs)—water use:Low

[Aronia species](#)/Chokeberry (Shrubs)—water use:Low

[Berberis species](#)/Barberry (Shrubs)—water use:Low

[Caragana species](#)/Peashrub (Shrubs)—water use:Low

[Caryopteris x clandonensis](#)/Blue Mist Spiraea (Shrubs)—water use:Low

[Chaenomeles speciosa](#)/Flowering Quince (Shrubs)—water use:Low

[Cytisus species](#)/Broom (Shrubs)—water use:Low

[Elaeagnus commutata](#)/Silverberry (Shrubs)—water use:Low

[Euonymus species](#)/Euonymus (Shrubs)—water use:Low

[Forestiera neomexicana](#)/New Mexico Privet (Shrubs)—water use:Low

[Genista species](#)/Dwarf Broom (Shrubs)—water use:Low

[Hibiscus syriacus](#)/Rose of Sharon (Shrubs)—water use:Low

[Ligustrum species](#)/Privet (Shrubs)—water use:Low

[Lonicera tatarica](#)/Tatarian Honeysuckle (Shrubs)—water use:Low

[Mahonia aquifolium](#)/Oregon Grape (Shrubs)—water use:Low

[Pinus mugo](#)/Mugo Pine (Shrubs)—water use:Low

[Prunus species](#)/Bush Cherry (Shrubs)—water use:Low

[Pyracantha coccinea](#)/Firethorn or Pyracantha (Shrubs)—water use:Low

[Rhus species](#)/Sumac (Shrubs)—water use:Low

[Ribes aureum](#)/Golden Currant (Shrubs)—water use:Low

[Shepherdia argentea](#)/Silver Buffaloberry (Shrubs)—water use:Low

[Symphoricarpos albus](#)/Snowberry (Shrubs)—water use:Low

[Syringa vulgaris](#)/Common Lilac (Shrubs)—water use:Low

[Yucca species](#)/Yucca (Shrubs)—water use:Low

[Acer circinatum](#)/Vine Maple (Shrubs)—water use:moderate

[Amorpha canescens](#)/Leadplant (Shrubs)—water use:moderate

[Buddleia species](#)/Butterfly Bush (Shrubs)—water use:Moderate

[Catalpa x Chilopsis](#)/Chitalpa (Shrubs)—water use:moderate

[Ceratoideis lanata](#)/Winterfat (Shrubs)—water use:moderate

[Cercocarpus ledifolius](#)/Mt. Mahogany (Shrubs)—water use:moderate

[Chamaebatiaria millifolium](#)/Fernbush (Shrubs)—water use:moderate

[Chilopsis linearis](#)/Desert or Flowering Willow (Shrubs)—water use:moderate

[Cotoneaster species](#)/Cotoneaster (Shrubs)—water use:Moderate

[Cowania mexicana](#)/Cliffrose (Shrubs)—water use:moderate

[Fallugia paradoxa](#)/Apache Plume (Shrubs)—water use:moderate

[Forsythia species](#)/Forsythia (Shrubs)—water use:Moderate

[Hamamelis x intermedia](#)/Witch Hazel (Shrubs)—water use:Moderate

[Hesperaloe parviflora](#)/Red Yucca (Shrubs)—water use:moderate

[Juniperus chinensis](#)/Sea Green Juniper (Shrubs)—water use:Moderate

[Kerria japonica](#)/Kerria (Shrubs)—water use:Moderate

[Kolkwitzia amabilis](#)/Beautybush (Shrubs)—water use:moderate

[Philadelphus virginialis](#)/Mock Orange (Shrubs)—water use:Moderate

[Picea glauca var. albertiana 'Conica'](#)/Dwarf Alberta Spruce (Shrubs)—water use:Moderate

[Pinus contorta 'Latifolia'](#)/Lodgepole Pine (Shrubs)—water use:moderate

[Potentilla fruticosa](#)/Shrubby Potentilla (Shrubs)—water use:Moderate

[Purshia tridentata](#)/Bitterbrush (Shrubs)—water use:moderate

[R. frangula 'Asplenifolia'](#)/Fernleafed buckthorn (Shrubs)—water use:Moderate

[R. frangula 'Columnaris'](#)/Tall Hedge Buckthorn (Shrubs)—water use:Moderate

[Rhamnus frangula](#)/Sea buckthorn (Shrubs)—water use:Moderate

[Rosa species](#)/Hardy Shrub Roses (Shrubs)—water use:Moderate

[Spiraea species](#)/Spiraea (Shrubs)—water use:Moderate

[Symphoricarpa x chenaultii](#)/Coralberry 'Hancock' (Shrubs)—water use:Moderate

[Thuja occidentalis](#)/American Arborvitae (Shrubs)—water use:Moderate

[Viburnum species](#)/Viburnum (Shrubs)—water use:Moderate

## TREES

[Acer ginnala](#)/Amur Maple (Trees)—water use:Deep Water 10-14 days

[Ailanthus altissima](#)/Tree of Heaven (Trees)—water use:Deep Water 10-14 days

[Calocedrus decurrens](#)/Incense Cedar (Trees)—water use:Deep Water 10-14 days

[Catalpa species](#)/Catalpa (Trees)—water use:Deep Water 10-14 days

[Cedrus atlantica glauca](#)/Blue Atlas Cedar (Trees)—water use:Deep Water 10-14 days

[Celtis occidentalis](#)/Hackberry (Trees)—water use:Deep Water 10-14 days

[Crataegus species](#)/Hawthorn (Trees)—water use:Deep Water 10-14 days

[Elaeagnus angustifolia](#)/Russian Olive (Trees)—water use:Deep Water 10-14 days

[Gleditsia triacanthos inermis](#)/Honeylocust (Trees)—water use:Deep Water 10-14 days

[Juniperus species](#)/Tree Juniper (Trees)—water use:Deep Water 10-14 days

[Maackia amurensis](#)/Maackia (Trees)—water use:Deep Water 10-14 days

[Maclura pomifera](#)/Osage Orange (Trees)—water use:Deep Water 10-14 days

[Malus hybrids](#)/Crabapple (Trees)—water use:Deep Water 10-14 days

[Pinus species](#)/Pine (Trees)—water use:Deep Water 10-14 days

[Platanus acerifolia](#)/Sycamore (Trees)—water use:Deep Water 10-14 days

[Quercus species](#)/Oak (Trees)—water use:Deep Water 10-14 days

[Robinia species](#)/Locust (Trees)—water use:Deep Water 10-14 days

[Sequoiadendron giganteum](#)/Giant Redwood (Trees)—water use:Deep Water 10-14 days

[Ulmus parvifolia](#)/Chinese elm (Trees)—water use:Deep Water 10-14 days

[Zelkova serrata](#)/Zelkova (Trees)—water use:Deep Water 10-14 days

[Aesculus hippocastanum](#)/Common Horsechestnut (Trees)—water use:Deep Water 7-10 days

[Carpinus betulus](#)/Hornbeam (Trees)—water use:Deep Water 7-10 days

[Cotinus coggygria](#)/Smoke Tree (Trees)—water use:Deep Water 7-10 days

[Cupressus glabra](#)/Arizona Cypress (Trees)—water use:Deep Water 7-10 days

[Fraxinus species](#)/Ash (Trees)—water use:Deep Water 7-10 days

[Ginkgo biloba](#)/Maidenhair Tree (Trees)—water use:Deep Water 7-10 days

[Koelreuteria paniculata](#)/Golden Rain Tree (Trees)—water use:Deep Water 7-10 days

[Laburnum watereri](#)/Golden Chain Tree (Trees)—water use:Deep Water 7-10 days

[Liquidambar styraciflua](#)/Sweetgum (Trees)—water use:Deep Water 7-10 days

[Liriodendron tulipifera](#)/Tulip Tree (Trees)—water use:Deep Water 7-10 days

[Malus domestica](#)/Fruiting Apple Tree (Trees)—water use:Deep Water 7-10 days

[Morus alba](#)/Mulberry (Trees)—water use:Deep Water 7-10 days

[Phellodendron amurense](#)/Amur Cork Tree (Trees)—water use:Deep Water 7-10 days

[Picea species](#)/Spruce (Trees)—water use:Deep Water 7-10 days

[Pistacia chinensis](#)/Chinese Pistache (Trees)—water use:Deep Water 7-10 days

[Prunus species](#)/Plum or Cherry (Trees)—water use:Deep Water 7-10 days

[Pyrus Species](#)/Pear (Trees)—water use:Deep Water 7-10 days

[Sophora japonica](#)/Japanese Pagoda Tree (Trees)—water use:Deep Water 7-10 days

[Sorbus species](#)/Mountain Ash (Trees)—water use:Deep Water 7-10 days

[Thuja occidentalis](#)/Arborvitae (Trees)—water use:Deep Water 7-10 days

[Tilia species](#)/Linden (Trees)—water use:Deep Water 7-10 days

[Gymnocladus dioica](#)/Kentucky Coffee Tree (Trees)—water use:Moderate

[Juniperus monosperma](#)/Singleseed Juniper (Trees)—water use:moderate

[Pinus edulis](#)/Pinon Pine (Trees)—water use:moderate

### Locate Your Meter

Most water meters will be located outside in front of your house next to the curb on the street under a steel or concrete lid.

### Reading Your Meter

There are two basic types of meters; a dial with a needle that measures in tenths of a cubic foot and a digital meter that measures from 100,000 down to 1 cubic foot. Most meters also have a small triangle on the face called a flow indicator. It will move when there is water passing through it. Read your meter from left to right.

### Measuring Water Use Activities

It is possible to measure the water use of certain activities. These activities include but are not limited to the following:

- Shower or bath use.
- Watering the lawn.
- Washing clothes or dishes.
- Flushing a toilet
- Washing a car

To measure the water use of an activity, do the following (in order):

1. Make sure all water off. This includes all faucets (inside and out), appliances, swamp coolers, or icemakers.
2. Write down the meter reading to two decimal places.
3. Perform the activity. Be sure to measure the amount of time in minutes that the activity required.
4. At the end of the activity read the meter again. Subtract the first meter reading from the second one. The result is the amount of water used for the activity in cubic feet. To convert to gallons multiply the result by 7.48. To determine how many gallons per minute were used divide the gallon amount by the number of minutes the activity required. You should now have the water used amount in *gallons per minute*.

### Detecting Leaks

1. Make sure all water off. This includes all faucets (inside and out), appliances, swamp coolers, or icemakers.
2. Write down the meter reading and time of day to the minute.
3. Wait at least an hour before reading the meter a second time. Make sure no water is used during the test. Read the meter at the end of the test and record the time to the minute. If the flow indicator is moving during the test you either have a leak or a meter malfunction.



4. Subtract the first meter reading from the second. Multiply the remainder by 7.48. The result is the amount of water in gallons that passed through the meter during the test period. Also record the time duration of the test.
5. Divide the amount of water by the number of minutes in the test. The result is the amount of water that went through the meter in *gallons per minute*.
6. To measure amount lost over time multiply the gallons per minute by the following:
  - 1,440 for gallons per day.
  - 43,920 for gallons per month.
  - 527,040 for gallons per year.
7. Locating a leak is a process of elimination. Shut off one toilet at a time at the wall. Go to the meter and check to see if the flow indicator (triangle) is still moving. If the triangle has stopped you have discovered the leak. If not go on to the next one and repeat the above steps.
8. Check your sprinkler system. Shut off the system at the anti siphon valve and check the meter.
9. Check your main service line. You will need to shut off the valve between your house and the meter. If the meter stops the leak is between the meter and the valve.
10. These steps can be repeated for every fixture and fitting in your home. In the event you cannot locate the leak, you should call a professional plumber to find and fix it.

# DOUGLAS COUNTY UTILITIES WATER WASTE REPORT FORM

Please use this form to report water waste. Our investigators must witness the waste in progress to issue a violation form. Please provide as much information as possible of help us identify the problem.

**TIME OBSERVED:****DATE OBSERVED (M/D/Y):**

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**ADDRESS OR LOCATION OF WASTE:**

<b>STREET ADDRESS:</b>	<b>CITY:</b>
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**MAJOR CROSS STREETS:**

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- ☐ OVER-WATERING
- ☐ BROKEN SPRINKLER
- ☐ TIME-OF-DAY VIOLATION
- ☐ ASSIGNED DAY VIOLATION

- ☐ FOUNTAIN / WATER FEATURE VIOLATION
- ☐ BROKEN PIPE OR ONSITE LEAK
- ☐ MISTING SYSTEM VIOLATION
- ☐ OTHER

**DESCRIPTION:**


## APPENDIX H – EPA Residential Benchmarks

Type of Use	Likely Range of Values
<b>INDOOR USES</b>	
Average household size	2.0 – 3.0 persons
Frequency of toilet flushing	4.0 – 6.0 flushes per person per day
Flushing volumes	1.6 – 8.0 gallons per flush
Fraction of leaking toilets	0 – 30 percent
Showering frequency	0 – 1.0 showers per person per day
Duration of average shower	5 – 15 minutes
Shower flow rates	1.5 – 5.0 gallons per minute
Bathing frequency	0 – 0.2 baths per person per day
Volume of water	30 – 50 gallons per cycle
Washing machine use	0.2 – 0.5 loads per person per day
Volume of water	45 – 50 Gallons per cycle
Dishwasher use	0.1 – 0.3 Loads per person per day
Volume of water	10 – 15 gallons per cycle
Kitchen faucet use	0.5 – 5.0 Minutes per person per day
Faucet flow rates	2.0 – 3.0 gallons per minute
<b>OUTDOOR USES</b>	
Average lot size	5000 – 8000 square feet
Average house size	1200 – 2500 square feet
Landscape area	4000 – 5000 square feet
Fraction of lot size in turf	30 – 50 percent
Water application rates	1 – 5 feet per year
Homes with pools	10 – 25 percent
Pools evaporation losses	3 – 7 feet per year
Frequency of refilling pool	1 – 2 times per year

## **APPENDIX I – DOUGLAS COUNTY LANDSCAPE AND WATER USE CODES**

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